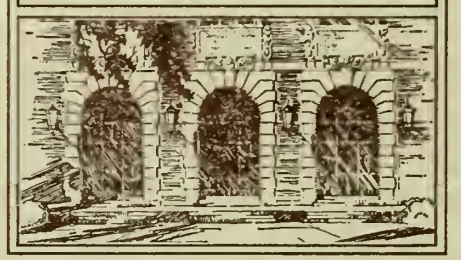

BRICK

A Monthly Magazine, devoted to Brick, Tile, Terra Cotta and Allied Clay Industries.

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We want our readers to feel always that BRICK is their paper, and that what interests them interests its publishers and subscribers. We will therefore appreciate most highly any communications, questions, experiences or suggestions, or marked copies of local papers containing items of news pertaining to the interests of clayworking.

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"Brick" to Have a New Home.

On May 1st, "Brick" will remove to new quarters, the Windsor & Kenfield Publishing Co. having taken a long-time lease on the property at Nos. 45 and 47 Plymouth Place, (directly opposite the Old Colony Building) Chicago. This is a four-story building 50 by 100 ft., most desirably located in what has come to be the publishing district of the city. It will be altered and refitted to specially adapt it to our needs. It is the intention of the company, so soon as it shall be installed in the new location, to greatly enlarge its mechanical department, practically doubling the present equipment.

The lease provides that the company shall have the option of extending the term for 50 years and in this event it will erect a modern building.

With this issue "Brick" begins its sixteen volume and presents the sixth Annual 10,000 Edition for the edification and entertainment of its readers. When our first special January edition was issued in 1897, the business of the country was just beginning to recover from what was doubtless the most severe and disastrous financial panic in our history; at that time we all felt confident that better times were ahead, but there was none who ventured to even hope for such an era of prosperity as followed. Business conditions in all lines improved steadily with scarcely any of even those temporary "reactions" which are usually considered inevitable, and perhaps desirable.

The country had experienced cycles of depression and prosperity but the "hard times" of 1892-96 were so severe that the general opinion was that in future we must accommodate ourselves to a permanently lower standard of prices and profits. The result, therefore, was most surprising. The demand for all products has grown and grown for five years and it still continues, notwithstanding that manufacturers have made desperate efforts to anticipate the need by greatly enlarging their plants. Our readers are familiar with the situation as regards clay products of all kinds; the manufacturers of clay working machinery all report the past year as a record breaker and at this time the great majority of them are embarrassed by the fact that the full output of their plants is required to fill current orders at a season of the year when they had expected to be able to manufacture for stock.

The iron market is the barometer of the business world and the present tendency in iron and steel prices is upward rather than downward. The United States Steel Corporation is exerting its efforts to keep prices down to their present level and thus prevent the abandonment of many enterprises that would be impossible were iron and steel to become too costly. The most conservative men in the iron trade are all agreed that the present immense demand is not speculative, but is due solely to the normal growth of the industries of the country.

Much difficulty has been experienced this season because of the car famine, although the railroads have been buying cars steadily for five years. The demand for cars and locomotives on the part of railroads are greater than ever, orders booked during the month of December being sufficient to take the output for nearly six months, although the works already had enough to keep them busy for a year.

In other lines the conditions are similar and thus while the past year has been an exceptional one for business we enter upon 1902 with even brighter prospects and confident of the future.

"Brick" welcomes the new year with an issue which surpasses even the previous "January Annuals" in value and interest, and extends to its readers everywhere sincere wishes for health, wealth and happiness.

Do not overlook the advertising pages of this number of "Brick." There you will find a catalog of all that you will need during 1902; keep it and have it for ready reference when the time for buying new machinery or supplies comes.

Clayworkers and the St. Louis Fair.

The announcements concerning the World's Fair to be held at St. Louis in 1903 come at a time when the echoes of the Pan-American Exposition have scarcely died away, and the great Columbian Exposition at Chicago in 1893 is itself still fresh in memory; therefore it would be inexcusable were the same mistakes in the matter of arranging the clayworking exhibits, that were made at those two expositions, to be repeated at St. Louis. Exhibitors who had clay products or machinery at Chicago and Buffalo were grievously disappointed in the results. These two expositions are cited because they are familiar to the great majority of our readers, but in this respect they are no different from other expositions. In them all there has been a most regrettable neglect of the possibilities which we are certain lie in a collective exhibit which shall properly display the clay industry.

This is not as it should be. The time is past when clayworkers are obliged to eat the crumbs from any man's table. We are strong enough and rich enough to obtain from the public at large the recognition which the importance of our work deserves—but to do it we must all co-operate. The mistake heretofore has been, clay products were scattered. Thus while at Chicago in 1893 and at Paris in 1900, there were most beautiful and costly exhibits of the different clay products, they were individual exhibits and so widely separated from each other that they in a large measure failed of their object. This was true of the most expensive individual exhibits. Credit for the fine displays was given to the Exposition authorities instead of to the exhibitors, because the general sightseer could not but believe that the displays were intended to be part of the architectural plan.

In other lines exhibitors have appreciated the necessity of having all exhibits of a kind placed in juxtaposition, and it is now time for the clayworkers to conform to this practice. The object cannot

be gained without united effort, however, and this effort "Brick" now calls upon you to make.

Some months ago "Brick" submitted to the management of the Louisiana Purchase Exposition a general scheme for a thorough and extensive representation of clay products. We were gratified to receive letters of commendation from the directors most directly concerned and a conference was arranged at St. Louis for a tentative consideration of the project. The scheme embraced many features but those which have received a definite consideration at the present moment are:

The erection of a 10 or 12-room two-story house from materials contributed by representative manufacturers of various clay products.

A collective exhibit of brick, tile, pottery, and sewer pipe machinery. A united display of individual exhibits.

All these to be so arranged as to be as near each other as possible in order to present to the visitor at the World's Fair some adequate idea of the powerful influence of the clayworkers of the United States upon the architecture of the country.

This is not intended to detract in any way from the clay exhibits of the several states which will doubtless be of the same character as at all former expositions. In these will be the usual display of different kinds of clays and the finished products manufactured from them. But these bear only a small relative proportion to the other mineral exhibits of any state and require comparatively small expenditures on the part of those who contribute these different products.

The whole matter was carefully gone over with Mr. David T. Day, chief of the department of Mines and Metallurgy of the United States Geological Survey, who showed his appreciation of the project. A part of the plan which received his immediate approval was the erection of a house composed entirely of clay products. He immediately offered to have it erected on the floor in the center of the Mines' Building, the space to be given free to the various exhibitors who will contribute to its erection by supplying the products, and bearing their proportion of the expense of building and maintenance.

Being thus assured of the support of Mr. Day, a representative of "Brick" then visited as many of the most prominent manufacturers of St. Louis as the time permitted. We were deeply gratified to find that every one consulted in the matter was heartily in favor of the movement and prepared to support it in every way possible. Similar visits have been paid to the Chicago firms with equally satisfactory results. "Brick" has also sent letters to manufacturers located elsewhere and has not the slightest doubt but that their responses will be in accord with those of their clayworking brethren whom we have already seen.

This then, is the position in which we are at present. We have one foot on the threshold of success and it needs but little more for us to make the coming display of clay products the best ever shown, but this is no time for halting. There is a saying in a very ancient book about the inadvisability of putting one's hand to the plow and looking backward, and this applies to us at the present juncture. The great trouble with all former expositions has been that too little preparation was made beforehand and the applications of tardy exhibitors far outgrew the possibility of supply by the distracted officials.

It is clearly impossible for Mr. Day, and those associated with him, to present any definite plan before the executive board of the Louisiana Purchase Exposition unless he has received from those interested some information as to the nature and extent of their prospective exhibits.

We therefore ask that every manufacturer of clay products, of clayworking machinery or of supplies for clayworking plants communicate with us immediately, telling us in a general way what they are prepared to do, whether they intend to make an exhibit, and how much of practical sympathy and co-operation they may be relied upon to extend to us in our efforts to obtain an organized clayworking exhibit of the most extensive character ever contemplated or executed. It is, of course, not expected that all will be able to sit down and at a moment's notice state exactly the amount of outlay that they are prepared to make in this direction. We simply wish to know definitely and immediately whether we may expect your co-operation and we will then forward the letters promising support to the place where they will have greatest effect.

It has been the custom in the past to give the clayworker the worst possible position. In all local exhibits in St. Louis, the clayworkers have been placed in the basement while the exhibitors of other industries have had preferred space on the main floor. This must not longer be. It is not a business-like scheme at all to have individual exhibitors, at an immense outlay, display before the public an attractive exhibit flanked on one side by a peddler selling spectacles and on the other by a stand devoted to the retailing of Exposition curiosities, postal cards and other souvenirs. We must exhibit at the World's Fair in the aggregate and impress the public with some idea of the dignity of the clay industry.

"Brick" has paved the way for you, and the Exposition authorities are anxious to give you a good location; we ask you to do your part and send an immediate response to this appeal and any suggestions for the advancement of the project which you can make.

Brick Dust.

The streets of Omaha, Neb., are being paved with Galesburg brick.

A new brick works will be erected at Charleston, W. Va., at a cost of $100,000.

The Granite Clay Co., of Akron, O., has increased its capital stock from $100,000 to $250,000.

E. S. Edwards, of Ayden, N. C., will receive catalogs and price lists from manufacturers of brick machinery.

The Union Brick & Supply Co., Columbus, O., is negotiating for a site for a branch of its manufactory, at Hill Top, a suburb of Columbus.

J. V. Rose & Son have put their new brick plant at Sharon, O., in operation with a force of 200 men. The plant is running at its full capacity to fill orders.

Trewhitt & Martin have transferred the contract for the construction of a new sewer system in Visalia, Cal., to the Stockton Terra Cotta & Pottery Co.

During a recent break-down of the local electric lighting system, the Salem (O.) China Co. was dependent upon lamps and candles for the illumination of its plant.

J. W. Bynum has burned his first kiln of 150,000 brick at his new yards at Lake City, Fla. The plant has a capacity of 40,000 brick per day. Mr. Bynum has completed a drying shed which will accommodate 100,000 brick.

The brickyards at Thurber, Tex., are turning out large quantities of brick to be used in the erection of the new epileptic asylum at Abilene. These brick are pronounced superior to any previously produced in Texas.

Canada's Clay Industries

Being Ye Faithfulle Cronicles of a Membre of Ye Staffe.

An hour's ride from Toronto, westward, brought us to the town of Milton, Ont., with 2,000 inhabitants, and snugly ensconced in the heart of beautiful rural scenery on the side of the tracks of the Canadian Pacific Railroad. We were well received by J. S. McCannell, vice-president and managing director of the Milton Pressed Brick Co., Ltd. It would be impossible to find a flaw in the courtesy with which we were received everywhere through Canada, but in J. S. McCannell we found the limit. Dr. Robertson is president of the company and its personnel has remained the same since its establishment in 1890. In that year, commencing with one Boyd press and one ornamental hand press the company began its upward climb to the front ranks of dry dressed brick manufacturers, and at the present day it holds a most honored position among the clay working establishments of Canada. Its exhibit at the Paris exposition was granted a bronze medal and its fine display at the Pan-American Exposition, described in detail in a recent issue of "Brick," received a silver medal award above all its competitors.

The plant is situated about a mile and a half from the town itself and approaching it from a distance it presents quite an imposing appearance. The buildings are of brick and frame and cover a considerable extent of ground. In the clay pits are found several kinds of very fine clay—the top is light buff clay of five or six feet in depth, yielding a gray brick; below this is a bed of dark red-brown shale from 30 to 40 ft. in thickness, from which is produced the famed red pressed brick which has won for the company so many honors. This bed is divided in certain parts of the pit by a stratum of green shale which burns a very fine buff color. The clay is worked out with drill and dynamite and hauled by cars on two separate switches to two dry pans. In these it is well ground and is fed by bucket elevators to the screens, the tailings being returned to the pan in the usual manner. One pan is by Goldie & McCulloch, of Galt, Ont., and the other by the Frost Manufacturing Co., of Galesburg, Ill. From the screens the clay passes to the hoppers which contain clay for about 5,000 bricks each. There are two 4-mold Boyd presses with a capacity of 14,000 each, which have been in operation a considerable time and have given entire satisfaction. From the press the bricks are then taken on barrows to the kilns.

MILTON PRESSED BRICK CO., MILTON, ONT.

A HAPPY BAND OF CANADIAN BRICKMAKERS.

The kiln equipment comprises five up-draft kilns and four down-draft kilns, all of them rectangular, and varying in capacity from 45,000 to 175,000 bricks each. The plant is also furnished with a Freese stiff-mud combination auger machine of 50,000 capacity. There are in addition two ornamental machines and a large stock of several hundred dies is at hand to supply every need of the architect

THE CLAY PIT AT MILTON.

and the purchaser. The addition of terra cotta to the company's products is comparatively recent and the right material for this manufacture is secured from the same pit. The terra cotta products are huge, ornamental pieces for buildings, facing columns for porches and in fact any detail sent by the architects can be faithfully rendered into permanent form by the skilled workers in the terra cotta department. Also the company excels in the manufacture of bricks for mantels which are made in red and buff colors, many designs being shown in the company's catalog, besides which may be seen cuts of all the ornamental brick made.

The grounds of the plant cover 130 acres and although the clay is only at present mined to the depth of 50 or 60 ft., it extends much deeper and is of uniform quality. In fact, the wealth of clay on this plant cannot at present be computed. Some time ago Mr. McCannell commenced drilling operations for a well and after having bored to a depth of 100 ft. found the same quality of clay, and no water being in sight gave up the drilling in disgust.

In all Canadian government work the Milton pressed brick is recognized as the standard in the specifications, which read, "To be

THE MACHINE ROOM AT MILTON.

faced with No. 1 Milton Pressed Brick or its equal." Nearly all the railway stations on the Grand Trunk in Canada are built with this brick, notably at Ingersoll, Paris, Pickton, as is also the postoffice at Woodstock. A new station of Milton brick is in construction at Galt and the Milton products are shipped as far east as Sidney and Cape Breton, Monkton, New Brunswick and Truro, Nova Scotia, and west as far as Sault Ste. Marie, Port Arthur and Winnipeg; in fact it is difficult to find a town in Canada where the Milton bricks are not found.

At the time of our visit several monstrous pieces of terra cotta were being made, some of which are shown in the illustration; the weight of these was over 300 lb. each. These were the first installment of a contract for 300 similar piece for one large warehouse in Toronto.

The drying of the brick is accomplished with wood in a week and the firing is carried on with coal, a total of six days being required for the burning of the product. The annual output of the dry dressed brick is slightly over 3,000,000 and several million of stiff-mud bricks are made annually. The number of men employed averages 50 the year through; the work is carried on the entire year and Mr. McCannell says that some years for him have 13 months.

The stiff-mud bricks are dried in hacks and require the same time for burning. The pressed bricks burn an even color in any part of the kiln. The plant has suffered much, however, from the lack of hands, and there is a good opportunity for steady men to find employment with the Milton Pressed Brick Co. The wages are not quite as high as paid the men in similar positions in the United States, but the cost of living in Canada is very much lower, and we should imagine, taking all into consideration, that the Canadian brickmaker would be able to put more money by than is possible in the United States.

The superintendent of the plant is J. Transom, who has had vast experience in brick and tile making in England and is filling his position with the Milton Pressed Brick Co. with great efficiency. The company is experiencing the general business rush which seems to be extending over the whole of this continent at the present time. The bricks were being pulled out of the kilns with great difficulty while they were still giving out a fierce heat, water being thrown upon them so as to cool them off sufficiently to allow their packing in the cars without danger of setting the cars afire. Needless to say, no straw was used in the packing. The products of the company are in increasing demand and it may be expected that at no distant date the plant will have to be considerably enlarged.

New York Notes.

The extremely cold weather coming in the middle of December has put a quietus upon the brick industry in this section. Never has the cold weather been known to come so early and hang on without a let up. The demand is good and those manufacturers who shut down with the advent of cold weather are going to run out before they start up operations again.

There is promise of a big job for contractors and manufacturers in the near future. An intercepting sewer is to be built in Syracuse, which will cost several hundred thousands of dollars. The sewer system was laid out by Samuel Gray, a sewer expert, when the city was small. The cross sewers, which he planned were built but the huge intercepting sewer, which was to run the whole length of the city, has never been built, the cross sewers being allowed to drain into Onondaga Creek. A short time ago the Supreme Court decided that the city had no right to drain the sewage into the creek any longer and must build the big sewer. This action was favored by Mayor James K. McGuire, and had he been re-elected last fall, it is probable that the contract would be let before this. As he was going out of office, however, at the first of the new year, nothing was done. The newly elected mayor, Jay B. Kline, will probably take up the matter and have the sewer built as soon as possible. It is a large job and the man who gets the contract will have a good thing.

Prices of common brick are well up. George W. Park & Son have just sold a large quantity for $7. This firm reports a big demand.

The New York Brick & Paving Co. is working its factory to the limit, having several big paving jobs on their hands. There is considerable trouble in getting cars enough, as they seem to be tied up so that they are not available. This puts the company behind in its orders.

After a closing down of several months the Empire Portland Cement Co. has resumed operations at Warner's yesterday. The plant has been entirely rebuilt, the rotary system having been adopted. This gives employment to a smaller number of men and gives more room. E. Bravender the superintendent, has resigned.

The Brick & Tile Manufacturing Co. of New Berne, N. C., was recently reported to be in the market for rails and other railway equipment.

The Brick & Tile Co., of Adrian, Mich., is installing special machines for the manufacture of United States mail boxes. The plant will turn out 200 mail boxes per day in addition to its regular product, and will be operated day and night for the present.

OHIO VALLEY LETTER

FROM OUR SPECIAL CORRESPONDENT

In taking a retrospective view of the year just ended, it can be said, without the slightest degree of exaggeration, that its equal has never before been witnessed in the Ohio Valley, in the extent of shipments of clay products. And in making use of the latter term I include everything it involves, from the commonest brick produced, to the highest grade of pottery ware manufactured in the dozens of large potteries now existing in the region referred to.

In this connection it might not be considered out of place to review, in a brief manner, what has been accomplished during the year just ended. I am not, however, in position to supply much data in the way of statistics touching upon the amount of ware made and shipped from the many sewer-pipe and brick plants and potteries located in this section, but I do not consider that the mere presentation of figures, which are at best but dry and uninteresting, would best serve the purpose intended. I might, however, say a word about the tonnage of fireclay which must necessarily be mined from the hills along the Ohio River in order to maintain the pipe and brick works in operation during a year like the one just witnessed, and I should state at the outset that the figures I submit are not the result of an insight into the record books of any of the corporations doing business in that territory, but are merely estimates, based on the little knowledge I possess of the clay industry and my acquaintance with the works in question.

There are, in the territory lying between the cities of Steubenville, O., and Pittsburg, and bordering on each side of the Ohio River, so far as my recollection serves me, 30 brick works all using fireclay and turning out paving, building and firebricks. Giving a very conservative average, these works should produce each at least 25 M. bricks per day. At some of them 40 M. and as high as 50 M. are made in a day. Counting 300 working days in the year, this would mean a grand total of 225,000,000 bricks. In computing the amount of raw fireclay consumed in the manufacturing of 1,000 standard size bricks, such as are made here, the quantity is usually placed at four tons. This being true, the amount of fireclay used in producing the quantity of bricks stated would result in a grand total of 900,000 tons, extracted from the hills along the Ohio River, between the points named, during the year 1901. In this calculation I have said nothing about the common bricks made in Pittsburg and vicinity during the same year and the amount of clay and shale consumed in their manufacture. Should I do this, the above figures would be augmented by possibly 200,000,000 bricks, and as these are somewhat smaller than the fireclay variety, 700,000 tons of clay and shale, would be a very safe estimate, considering the fact that the common brick works have been about as busy during the past year as those in the fireclay region. Neither have I included in my figures the number of bricks made at the many works lying just east of Pittsburg, using both shale and fireclay, which would swell the figures to the extent of possibly 100,000,000 more.

Concerning the extent of the industry of sewer pipe making along the river between the points named—Steubenville and Pittsburg—I might add there are at present 12 factories, in the operation of which, in a steady year's run like the one just completed, at least 350,000 tons of fireclay would be consumed.

This very meagre calculation will possibly serve to convey some idea of what is meant by a brisk year in the clay business in the Ohio Valley and the amount of work it furnishes for men and boys. I might also add in this connection that there are several plants turning out ground clay, where neither bricks or pipe are made. From these factories it is safe to assert that 75,000 tons of fireclay are shipped annually to the mills and glass houses throughout the country. So far nothing has been said of the amount of ware produced at the various potteries and number of men employed in its manufacture, and I shall not touch on that part of the subject at this time. Suffice it to say, however, that the number of persons employed in these establishments along the Ohio Valley will run well up into the thousands.

As I look back over the past year I see, among other things, the brick manufacturers have pursued throughout the entire year the customary course with reference to the mode of selling, namely, keen competition and the usual amount of cutting. Taking it as a whole, however, the prices which have prevailed have been very good, and I think sufficiently so that a fair margin of profit out of the year's business has been afforded. In fact, some brick manufacturers to my knowledge have declared what might be considered fabulous dividends during the year, the amount of which I am not at liberty to divulge. In a recent conversation with a very prominent brickmaker, I was informed that the subject of forming a paving and building brick combination in the fireclay region, to regulate selling prices, might be again brought up in the very near future and a meeting called of all such manufacturers for the purpose of taking some action in the matter. While such an organization might be considered possible, if undertaken in the proper manner and with the right person at its head, there is little prospect in my opinion of anything being accomplished along that line. The thing has been attempted so often and without success, that the failure of such a proceeding, should it be attempted again, is almost inevitable.

With reference to the sewer pipe manufacturers, I can perceive that far different conditions have prevailed than those ascribed to the brickmakers, and I feel no hesitancy in asserting for the sewer pipe men that the last year is the best they have experienced for a long time. Prices have been exceptionally good and there has been manifested such a spirit of "sticking together" as has not been in existence hitherto, at least not for many years. Of course, it is generally understood that the American Sewer Pipe Co. controls the majority of pipe works in this territory, the few works mentioned as being located along the river, representing less than one-half of its holdings. This company early in the year advanced the selling price of all pipe to such an extent that it was the consensus of opinion the new selling schedule could not long exist. But the persons making such predictions (principally buyers of course) were doomed to disappointment, for not only has the American company maintained its stand in this respect throughout the year, but the independent manufacturers as well got together on a similar basis and have sustained their position up to this time. In view of these facts, as I know them to exist, and the extent of demand, it can safely be said that the sewer pipe manufacturer also ended the year with a very fair margin of profit on the business transacted.

There have, however, been several new sewer pipe plants built during the past year and some which have been idle for sometime placed in operation, and there will be others built before spring; but notwithstanding these new powers, there is no cause for alarm concerning the future of the business, and from indications the present manufacturers are treating the fact of these new additions with very little concern.

There seems to have been but one thing, throughout the past year to mar the prosperity and felicity of manufactures of clay products. But as that is a subject I touched upon at some length in a former letter, I will merely mention it now in passing. In fact it is hardly necessary even to make mention of it so far as those interested is concerned. So thorough has been the grievance, that a mere hint is sufficient. I refer to the car shortage, which during the past few months has meant the loss of thousands of dollars to shippers of brick and pipe in the Ohio Valley.

Another feature of the clayworking industry which seems to have flourished, quite materially, during the past year, is that of making fireproofing and hollow building blocks, a branch of the business which has hitherto been carried on in a small way by comparatively few persons. The many high buildings which have been erected in Pittsburg recently, and the prospect of several others to follow, have created a demand for hollowware which has never existed before, and have been the cause of several factories starting up in that line of work. To my knowledge several brick plants have been equipped for that work and others are now being prepared to begin in the spring.

Considering the number of new factories that have been erected in this territory during the past year and the great amount of changing done at old works, such as displacing old machines with new and larger ones, the brick machinery manufacturers should also be satisfied with the year's business.

The annual convention of the United States Potters Association convened in Pittsburg December 10th. The sessions, which lasted almost three days were held in the palm room of the Hotel Henry. Upwards of 100 potteries were represented. Among other matters which came before the convention for action, that of a reduction of freight rates was discussed at considerable length, and while no definite action seems to have been taken along that line, it is quite possible something will be done in the near future. It seems pottery-ware is now rated in second, third and fourth classes, and the object is to secure, if possible, a re-classification by the railroad companies. The concensus of opinion is that pottery-ware should be listed in the fourth and fifth classes. It also appears that certain railroad companies have signified their willingness to concede the claims of the potters in this respect by granting a reduction of rates, such change to become effective at a very early date. The matter of an advance in the selling price of ware also came up for its annual discussion. Certain representatives are said to have entered the convention with a determination to have resolutions enacted for an increase in prices, but the majority ruled otherwise and the selling schedule will therefore remain as it stands for another year at least. Charles H. Cook, of Trenton, N. J., and H. A. Keffer, of East Liverpool, O., were re-elected to the offices of president and secretary respectively. Other officers elected were as follows: first vice-president, Joseph G. Lee, East Liverpool; second vice-president, James Pass, of Syracuse, N. Y.; third vice-president, W. E. Wells, East Liverpool; George S. Goodwin, of East Liverpool, treasurer. The convention next year will be held in Washington City.

The Ohio state inspector of factories has recently made a tour of certain sections of the Ohio Valley, and as a result the visible supply of small boys engaged in potteries and other clay industries has been greatly reduced. It appears the inspector had been informed that the law with reference to hiring boys under a certain age was being ignored to a considerable extent, hence the investigation and results as stated.

The style of the firm building the large sewer pipe works at Irondale, O., is to be East Ohio Sewer Pipe Co. Contracts have been awarded for the buildings which are to be erected by parties from Toronto, O. The main building is to be 300 ft. long by 90 ft. wide, with an annex 60 by 70 ft., all to be three stories high, and a frame structure. This certainly appears like a commodious building, but the space will be all needed to meet the requirements of the business for which it is intended. In order to assure the best results in making sewer pipe, it is the part of discretion to dry the material after coming from the press, very slowly and to do this, where the output is very considerable, as will be the case in the new works in question, it becomes necessary to provide quite an extensive area of floor surface. The East Ohio plant will be equipped with all improvements necessary to carry on the business economically and successfully and will be fitted out with presses and pans by the Stevenson Company, of Wellsville, O. It is evidently the intention to devote the entire plant to the manufacture of sewer pipe, as no provision is being made to install any other kind of machinery. No bricks will be made, the purpose being to purchase, from nearby brick works, all that will be required in the erection of kilns, building foundations and setting machinery.

Most of the pipe and brick works at Toronto, O., were closed several days owing to lack of water, due to some trouble in the city water works whence the supply is obtained. The council of West Homestead, Pa., has passed an ordinance for a bond issue to provide funds for buildings sewers in the town.

What might be considered a large order for tableware is that said to have been received by the Chelsea China Co., of New Cumberland, W. Va., for 450,000 dozen cups and saucers.

The International Union of Bricklayers and Masons will hold its annual convention the second week in January at the Monongahela House, Pittsburg, a hostelry which has been the scene for many years of conventions of various character. Preparations have been made to entertain a great many delegates and an interesting session is expected. An extensive and elaborate souvenir program is being prepared, in which will appear advertisements of the majority of the leading facebrick makers represented in Pittsburg.

A company composed of Pittsburgers has been formed to take over the interests of F. B. & J. H. McFeely who recently completed the erection of a silica brick works at Latrobe, Pa., some 40 miles east of Pittsburg. The new company was chartered with a paid-up capital of $30,000. Among the officers are F. B. McFeely, president, and Geo. Wheeler, secretary. The new plant, which has just been placed in operation, is provided with a very complete equipment for making silica brick, but as these will be hand-molded, the amount of machinery required is not large, and in this case consists of a 100-h. p. outfit and an 8-ft. wet pan. The molding at this plant is done in steel molds, or, I might properly call them frames, such as are used to a certain extent throughout the firebrick section. These steel frames are placed on pallets made of the same material, and the molding is then performed in the customary manner, but instead of having boys, or men as the case might be, to off-bear the bricks and dump them from molds onto a dry floor, with this process all that is required after filling the molds (which are, of course, bottomless) in the usual manner, is to simply raise the steel molds and perfectly formed bricks appear on the pallets. These pallets are then placed on rack cars and conducted into a tunnel drier from which they are removed the following day and set in kilns for burning. This is certainly a very expeditious may of making hand-molded bricks and is far superior and less expensive than the method usually practiced in connection with the hot floor arrangement for drying. The drier at the McFeely plant was built by the Pittsburg Hot Air Dryer & Construction Co. The

kilns in use here are of the square, down-draft variety and are of a pattern used largely by silica brick manufacturers. Two of these kilns have thus far been built but it is the intention of the company to proceed at once with the erection of additional ones.

Mr. Harbison, the senior member of the Harbison-Walker Co., of Pittsburg, the largest firebrick manufacturing concerning in the state, has swelled the endowment fund of the Western Theological Seminary, of Allegheny, a Presbyterian institution, to the extent of $50,000. Mr. Harbison, in addition to being a very successful business man, is also a prominent member, and liberal supporter, of the presbyterian church and a man of whom that denomination has just cause to be proud, not only on account of his benefactions, but also because of the interest he manifests in church work in other than a financial way and in other institutions that have to do with the betterment of mankind.

The work of paving with vitrified brick a certain section of public roadway in Jefferson County, Ohio, a short distance north of Toronto, has been completed and the pavement is now doing actual service. It is a splendid piece of highway and is a pronounced success in every particular and the work was readily accepted by the county commissioners. It was thought sometime ago, and I even went so far as to vouchsafe a prediction in a recent letter, that the paving of the section of the road referred to would be the forerunner of considerable work of that character and it was thought that brick pavement might largely displace macadam roadway, at least, at points within a radius of a few miles from works where the material is to be obtained. It seems now, however, the cost of paving is considerably in excess of that of macadamizing and it is possible, so much so, that the commissioners of that particular county may abandon the idea of paving any additional roadway, at least for the time being, and it is quite possible also, that if the subject is dropped at this juncture, it will be years before it is revived. The brick roadway is recognized as being far superior to the other variety and the reason more work of that character is not proceeded with at once, it simply due to the matter of cost.

A pottery manufacturer from Japan is making a tour of the Ohio Valley potteries.

An automatic cutting table has been placed in the Humphrey firebrick works at Gatztown, Pa., by the J. D. Fate Co., of Plymouth, O.

At the Manown Pa., firebrick works of the Pittsburg Coal Co., recently re-equipped with new machinery by the American Clay-Working Co., of Bucyrus, O., several down-draft kilns are being built by Thos. Wilson, of Layton, Pa. Mr. Wilson has built quite a number of his kilns at different firebrick works in the vicinity of Pittsburg, all of which seem to give excellent satisfaction. The Wilson kiln seems to be particularly adapted for firebrick burning, and is also quite successful for common brick, but for the latter it is considered by some to be rather expensive. I do not mean, however, that this kiln is more expensive than other styles of kilns in the matter of operating, as such is not the case, but it is held that the cost of erecting this kiln is rather in excess of what is necessary for burning common brick, for which purpose a cheaper variety of kiln answers the purpose fairly well. I have no personal knowledge of the Wilson kiln being in use at paving brick works, but it occurs to me there is no manifest reason why it should not be well suited for burning paving material.

The Belmont plant of the Suburban Brick Co., of Wheeling, W. Va., has been visited by fire, which caused a possible loss of $10,000. The Belmont plant is located at Martins Ferry, O., just across the river from Wheeling, and is considered among that company's best works as it was well equipped in every particular. The Suburban company fortunately, and wisely as well, keeps its several works well insured and I am informed the loss at the Belmont plant is fully covered. The fire was confined mostly to the building containing the machinery, other departments escaping with but little injury. The steam drier was, however, damaged to a certain extent, in fact some 10 ft. of the wood work lying next to the machinery building was destroyed, but as the pipes were not injured any to speak of, the cost of repairing this department, and placing it in readiness for use again, will not be a very large item of expense. The machinery building was a complete wreck and will have to be replaced with a new structure. The machinery is all more or less damaged, but the most of this, it is thought, by repairing and overhauling can be again made fit for use. The work of rebuilding the works will be proceeded with just as soon as necessary arrangements can be completed.

The work of installing new machinery in the Chelsea pottery, at New Cumberland, W. Va., is now going on. The plant, however, is running full time as usual.

The bricks for paving certain thoroughfares in Corapolis, Pa., are being shipped from the Bradys Run works of the Pennsylvania Clay Co., of Rochester, Pa.

A temporary building has been erected at the Briggston plant of the American Clay Manufacturing Co., of Pittsburg, to take the place of the one recently destroyed by fire, and the plant is again in operation. Considering the extent of the fire and the amount of damage resulting therefrom, the time the Briggston plant remained idle was certainly very brief. In fact, the fire had scarcely died away, when the work of removing the debris and preparing for another building was begun. In addition to other machinery, it was found necessary to install a new engine. The one purchased was made in Cincinnati and is 150 h. p.

The Myers Clay Manufacturing Co. is the name of the firm which recently acquired the fireclay acreage near Toronto, O., mention of which was made in my letter last month. George Myers, formerly of the Ohio Valley Fire Clay Co., whose sewer pipe plant situated near Toronto, was purchased by the American Sewer Pipe Co. (the trust), seems to be one of the leading spirits in the new enterprise, other members of the firm being as follows: William F. and James W. Myers and Jennie M. Stillwell, of Toronto, O., and George T. Heppenstall, of Pittsburg. The new concern was chartered in West Virginia and is capitalized at $100,000. Mr. Heppenstall, mentioned as one of the incorporators, is a dealer in sewer pipe and other clay products, with office and yards in Pittsburg. The work of opening up clay mines has been already started and it is said the company will soon begin the erection of buildings for an extensive sewer pipe factory.

It is given out that the Clifton and Sligo works of the Mack Manufacturing Co., at New Cumberland, W. Va., now running on sewer pipe, will be continued in operation all winter. The product of the Clifton plant has consisted largely of pipe for several years past and the business seems to have been carried on quite successfully. As to the Sligo works, however, that much cannot truthfully be said. Some years ago a press was installed there and the work of making pipe commenced and carried on for some months, or possibly upwards of a year, but the venture at that time might have been considered anything but satisfactory. The difficulty did not apparently rest in the work of preparing the clay and forming the pipe, that part of the work being performed in a manner equal to that done at any of the several neighboring works, but the whole difficulty seemed to result from the burning. The breakage in the kilns was said to be enormous and the causes of the trouble was placed on the quality of the material used in the manufacture of the ware. After operating under great disadvantage and evident loss for a time, the business of making pipe at the Sligo works was abandoned and after remaining idle for a considerable period brickmaking was resumed at this plant, and the large quantity of material, which, while not suited for pipe made very good paving bricks, was used up. I am informed now,

however, that the pipe being produced at this plant, and from a different mixture of material from that used in the first instance, is of a very excellent quality and the amount of breakage in the kilns is not in excess of what is usually expected.

The Union and Rockside paving brick works of the Mack Manufacturing Co. have both been closed temporarily and during the brief stop a considerable amount of repair work is to be done.

I have received information from a reliable source that in all probability ground will be broken in the spring for another pottery at Sebring, O.

Quite a number of Ohio Valley brickmakers have signified their intention of attending the convention in Cleveland in February and it is possible the representation from that section will be larger than usual. It does not necessarily follow from this expression, however, that the brickmaking fraternity here is exhibiting any keener interest than usual in convention matters, but the anticipated increase in attendance, I think, may be attributed solely to the fact that the place of meeting this year is not far distant and quite easy of access.

In this connection I might say that it has occurred to me that these conventions, held largely in the interest of brickmakers, are not as well attended by the latter as they really ought to be and I sometimes fear the real object of the sessions is often defeated for many, on account of the ardent desire of such persons to make the gathering a social event and an occasion for a "good time." I do not, however, wish to be understood as trying to belittle the social feature of the convention, neither do I seek to abridge (if such a thing were possible) the liberties of those who attend just for the mere purpose of having a little enjoyment; for in my opinion it is impossible for members of any particular craft to become too closely allied on a social basis. But what I do claim is that the primary object and aim of these conventions is to enhance the business of brickmaking and this can be accomplished by an interchange of opinions on the subject and by the public testimony of those persons well versed in experimental, and theoretical, knowledge of that particular line of work. In order then to receive full benefit of a meeting of this character, it is quite essential that as many of the sessions be attended as is possible. The theory has been advanced quite frequently outside of the convention, both by brickmakers as well as by persons engaged in the business of manufacturing brickmaking machinery, that some change is necessary in the general management and conduct of these gatherings in order to create and assure the greatest degree of benefit to the members and success of the convention. In other words, many have expressed themselves as being of the opinion a change in the officers (or rather, one of the officers), might not be detrimental to the interests of the association. Granting this, the way to affect a change of such a character as they claim to be necessary is not to remain at home, or if at the convention absent oneself from the sessions, but to be present at the meetings, and be very much in evidence when the matter of electing officers for the ensuing year comes up for action. It is without doubt the duty of those holding these opinions to start the ball rolling in the right direction and present themselves at the convention with a full determination to carry their convictions to a successful culmination and that only can be accomplished by taking a firm and decisive stand on the floor of the convention. I make these suggestions in passing, not because all are not cognizant of their duty in these matters, but rather for the simple reason that a call to duty along these lines is very opportune.

The Philippi (W. Va.) Brick & Tile Co. will furnish 4,500,000 brick to be used in the erection of the new buildings of the West Virginia Paper Co., at Luke. The contract is said to be the largest ever awarded to a West Virginia company.

Extensive Improvements in the City of Havana, Cuba.

Specifications for bidders on the contemplated sewerage and street paving systems for the city of Havana were issued by the mayor on February 23, 1901. In these improvements there will be required 500,000 meters of sewers and drains of every dimension and 488,000 square meters of brick pavement. Our latest advices from the city engineer of Havana are to the effect that none of the contracting has been let so far, though the usual rumors of probable participants in this extensive municipal enterprise have been circulated.

The Pittsburg Drier.

The Pittsburg Hot Air Drier & Construction Co., of Pittsburg, advises us that the great majority of the driers installed in the Pittsburg and Ohio Valley district have been erected by it, which is certainly a most satisfactory record. This company builds driers under patents granted to W. B. McHenry, who first built his driers near his home in West Virginia. Early in 1900 Mr. McHenry removed to Pittsburg and organized this company, which during the last two years has built "Pittsburg" driers at a great many plants. Among these are the following: Minor Fire Clay Co., Empire, O.; Mack Manufacturing Co., New Cumberland, W. Va.; Clinton County Fire Brick Co., Mill Hall, Pa.; Pittsburg & Buffalo Co., Pittsburg; Central Savage Brick Co., Rockwood, Pa.; Dunbar Fire Brick Co., Dunbar, Pa.; Miller Brick Co., Rochester, Pa.; Delaney Fire Brick Co., Fairchance, Pa.; W. H. Eggers, Cleveland; Wardenclyffe Brick & Tile Co., Long Island; Shannopin Brick & Sand Co., Shannopin, Pa.; Penn Branch Brick Co., Branch, Pa.; Reese-Hammond Fire Brick Co., Bolivar, Pa.; (two driers) Kane Brick Co., Kane, Pa.; W. J. Rainey, Mt. Braddock, Pa.; Union Stone & Brick Co. and Washington Brick Co., at Washington, Pa.; Frank Peifley, Greensburg, Pa.; Youngstown Brick Co., Youngstown, O.; Standard Brick Co., Empire, O.; Jos. Soisson Fire Brick Co., Connellsville, Pa.; (two driers) Claymont Brick Works, New Cumberland, W. Va.; Latrobe Brick Co. and F. B. & J. H. McFeely, Latrobe, Pa.; John Miller, Washington, D. C.; Glen Elk Brick & Material Co., Clarksburg, W. Va.; American Sewer Pipe Co., Pittsburg; Lincoln Fire Brick & Shape Co., Bolivar, Pa.; Stuart Fire Brick Co., Pittsburg; Lac du Bonnet Co., Winnipeg, Man.; Homestead Brick Co., Homestead, Pa.; Freeport Clay Manufacturing Co., Pittsburg; Federal Brick Co., Hite, Pa.; Allegheny Valley Brick Co., Tarentum, Pa.; O. W. Weyer, Buffalo; Glassport Brick Co., Glassport, Pa.

The South San Francisco Pottery Works is now turning out a large quantity of terra cotta and sewer pipe.

Ross & Clark, proprietors of the Cannellton (Pa.) Pottery Works, are considering removing that plant to Hawesville, Ky.

The Ross-Keller Brick Co., of St. Louis, Mo., has been granted authority to extend its business operations to include Texas.

The Reno Pressed Brick Co., of Reno, Nev., is still doing an extensive business. The company expects to operate at full capacity until cold weather necessitates the shutting down of the plant.

Carl Leonardt, a Los Angeles contractor, has secured contracts for the brick and concrete work on the four large buildings to be built by the Los Angeles R. R. Co. at the corner of Seventh and Alameda Sts., in that city. The contracts call for over three million brick and about one hundred thousand feet of concrete construction. This is one of the largest contracts ever let in Southern California.

A MONTH IN THE WORLD'S HISTORY

The 57th Congress convened at Washington at noon on Monday, December 2d, to be in session for six months. President Roosevelt, in his annual message, favored the revision of the immigration laws, government aid for the irrigation of arid lands, the creation of a new government department of commerce and industry, Chinese exclusion, the general principle of reciprocity and the granting of concessions to Cuba. Among the important bills on the calendar for consideration early in the session were the ship subsidy bill, the Nicaragua Canal bill, and one looking to the construction of a submarine cable from the western coast of the United States to Hawaii.

December 2d, the United States Supreme Court rendered two important decisions, the first concerning the right of the government to collect customs duties on articles imported from the Philippines, and the second regarding Porto Rican tariff. In the former, the court held that the Philippines have been domestic territory since 1898, and under the present tariff laws, duties cannot be collected. In the case of Porto Rico, the court held that Congress may erect a tariff barrier between the United States and its possessions. It is thus apparent that laws may be enacted, erecting a tariff barrier between the United States and the Philippine islands similar to those which govern commerce with Porto Rico. The Supreme Court declares such legislation constitutional, which, when it was first proposed, was denounced as unconstitutional.

As a result of the recent financial crisis in the Philippines, when the fall in the price of silver and the price of exchange caused a heavy run on the postoffice in Manila, an investigation of the currency situation in the islands has been made by Special Commissioner Charles A. Conant, who reports to Secretary Root that there should be a distinctive Philippine coin of silver, which shall be legal tender for 50 cents in gold, and shall contain 25 grammes of silver. It is also recommended that, after a certain date, the Mexican silver dollar shall cease to be legal tender in the islands. There has been trouble brewing in Manila since local speculators began importing Mexican dollars from Hongkong and buying gold money orders from the postoffice. For a time a six per cent premium in American paper money was paid for American gold.

Scandal from the court of Holland has been given prominence by the daily press during the month, and goes to show that "life is not all beer and skittles" even for royal young persons with a large bank account. Wilhelmina, the queen who was married to the man of her choice about a year ago, is said to have been persistently neglected by him since the wedding, and subjected to open insults on more than one occasion, from her consort.

December 13th, Secretary Long made public the findings in the Schley court of inquiry. The majority of the court censured Admiral Schley on all points under investigation except that of his conduct in battle, which was commended. Admiral Dewey sustained Schley on many of the points where the latter was censured by the court, and gave him credit for the Santiago victory.

December 10th, a royal proclamation announced June 26, 1902, as the date of the coronation of King Edward VII of England. Until then there will be a lively polishing up of crowns and coronets and refurbishing of clothes in preparation for the great event, for a king has not been crowned in England probably in the memory of the oldest inhabitant, and it is the dutiful intention of Edward's subjects to make this occasion shine resplendently in the history of the age. The festivities will include a gigantic naval demonstration in which every power will be represented by a ship flying an admiral's flag. There will be music by the band and fireworks in the evening.

Recent advices announce that the rebellion in Colombia, which has been carried on intermittently since October, 1899, and has cost the lives of 50,000 men, to be practically at an end. This South American republic is in a deplorable condition as the result of long continued civil strife. Paper money has depreciated so that $45 in such currency is equal to only $1 in gold. The actual loss in money incurred is estimated at $250,000,000 and Colombia's resources are exhausted.

December 24th, a considerable force of Boers under the famous guerrilla general De Wet, captured four companies of Imperial yeomanry at Tweefontein, in the Orange River colony. The British loss is believed to have been a heavy one, though no details as to the number killed and wounded were given by Lord Kitchener in his subsequent report.

Signor Marconi's system of wireless telegraphy has been successfully employed in transmitting messages across the Atlantic ocean from Cornwall, England, to St. Johns, Newfoundland, a distance of 1,700 miles. This achievement has called forth the prediction from many quarters that the present system of submarine cables between Europe and America will, in the not far distant future, be replaced by the wireless telegraph at a great reduction in the cost of the service. Marconi himself is quoted as saying that, could the new method be applied, the cost of cabling from the United States to England, which is at present 25 cents a word, might eventually be reduced to one cent a word.

Parisians are experimenting with a new process by which alcohol is to be manufactured from fruit, grain and vegetables at a much reduced cost, rendering its use practicable for many industrial purposes. At a recent exhibition in Paris sixty patterns of alcohol illuminating appliances were shown, and it was claimed for them that they rivaled electricity in their brilliant effect. The advantage of using alcohol for fuel and as a motive power for automobiles was strongly advocated.

December 25th was celebrated everywhere in Christendom as the birthday of our Lord by Christmas services in churches, feasts, and the exchange of gifts as expressions of good will. In Europe, the wooden shoes that peasants place expectantly beside the hearth, and in American homes, the stockings that dangle from the mantle, were filled this year as bountifully as ever by that benevolent spirit which masquerades on Christmas eve as St. Nicholas, Kris Kringle, or Santa Claus. Long may he prosper!

The increasing business and prosperity of clayworkers during the year that is past has been reflected in the increasing business and prosperity of "Brick," for which we are duly thankful, with the hope that the New Year has health and good fortune in store for us all.

CORRESPONDENCE.

By reason of its large circulation "Brick" offers exceptional advantages for the exchange of information on practical subjects in which the clayworker is interested, and we urge our readers to avail themselves of the "Brick" correspondence columns, and lay their questions and troubles before their fellowworkers, some of whom are almost sure to know the best solutions for the problems. All answers which we can print will be paid for at our regular rates. Where the subject permits of it a sketch or drawing will often add greatly to the clearness of the answer.

TAKE HEED, MR. ADVERTISER.

Editor of "Brick":—I should be much obliged to you to send us copy of "Brick" regularly as I have leased a yard and wish to purchase some new machinery. This notice will doubtless attract some of your advertisers with whom I should be pleased to communicate with the object of effecting a purchase. Very truly yours,

Covington, La. C. Alexis.

KIND WORDS FROM AUSTRALIA.

Editor "Brick": I am much pleased with "Brick," as it gives a great amount of useful information, and I have acted on many of the articles appearing in it. I would not care to be without "Brick," and when I have read it I generally lend the paper to several of my workmen, who are loud in its praises.

M. Cardin, Mgr.,

Croydon, Australia. Excelsior Brick Works.

WHAT "BRICK" DOES.

Editor "Brick": A sense of justice prompts me to testify in this way to the value of "Brick" as an advertising medium. The advertisement of my roofing tile machine in your journal has not only brought me numerous inquiries from the United States, Mexico and Canada, but also from such foreign countries as France, Denmark, India and Costa Rico. This result from a few months' advertising speaks well for "Brick." Yours truly,

A. H. Murray, Mgr.,

Huntington, W. Va. Murray Roofing Tile Machine Co.

WILL A WET PAN WORK.

Editor "Brick:" I would like to have some of your readers tell me whether a wet pan is used successfully to grind clay for the soft-mud process, and whether it can be arranged to feed a soft-mud brick machine automatically, or nearly so.

Our clay has caused us a great deal of trouble; we have tried straight rollers and disintegrators to thoroughly grind it, but have not been able to get it sufficiently fine. When this clay is broken down between the thumb and finger it works out until we get a small particle of what is apparently sand, but which we have proved to be iron oxide. This little lump often breaks the brick; besides, the oxide being in a lump does not mix throughout the brick and improve the defective color as would be the case were it ground up fine. We can make the clay fine enough by passing it through our tile mill, but this requires much more power than a wet pan would, at least we so understand. We would like to get the benefit of the experience of others in this line.

Tough Clay.

NEWS FROM NOVA SCOTIA.

Editor "Brick": I was very much pleased to receive some time ago a report from our new brick works at Wallace, Nova Scotia, written by Mr. George Battye, the superintendent. Though the capacity of the plant is only supposed to be 25,000 per day, 40,000 are really turned out, and the quality is equal to any in the market at the present time. The machinery was purchased from the American Clayworking Machinery Co., of Bucyrus, O., and is giving good satisfaction. This is an important item, as brickmaking is too costly to go into for the purpose merely of experimentation. Forward "Brick" on to my new address, I am very pleased with it. Very truly yours,

Samuel Nyett.

EMGEE WILL WRITE HIM.

Editor "Brick:" In "Brick" for December I read an article on the use of coal dust in making brick, the writer signing himself "Emgee." Could you give me his address as I wish to write him for further information on this point. Yours truly,

Leon, Ia. W. H. Hawkins.

REPLY TO QUERIES ON COAL DUST.

Editor "Brick": I reply with pleasure to the inquiry for more particulars about coal dust. Sometime between 1830 and 1840 a brickmaker by the name of Woods, while reading his Bible, came across the passage relative to the making of bricks without straw. In thinking over what he had read he concluded to try an experiment by putting cut straw in the brick. About that time anthracite coal was being introduced for household and furnace use, and crushing some he used it in place of the straw. After repeated experiments, the time of burning his kilns was reduced from two weeks to one, with a great reduction in the amount of fuel burned and a more uniform grade of brick was produced. He applied for a patent, and other brickmakers beginning to profit by his discovery, without paying a royalty, he sued them, but lost because they did not use the same amount he did or what the patent covered, he also having to swear that different clays would require different amounts of dust. No doubt the patent attorneys of today would have covered the ground much better.

The dust should be anthracite, about the size of large screened building sand. If coarser, use slightly less; if finer, more. It is mixed with the clay at the machine, and done in such a way that it is not only well mixed through each brick, but that every brick gets its proportion. If you wish to change the amount of dust, wait until you start a new kiln; do not have brick of varying quantities of dust in one kiln. It is best to charge any fault in the kiln to a wrong method of burning and try to correct that, rather than change the dust materially. Too much dust is apt to result in light colored benches and a too hard burned top; too little dust, vice versa. In drying off or watersmoking, you will have to keep your fires so low or dark that the coal dust in the brick does not catch fire until you are ready to heat them to a good hard brick color. The whole secret of success is in watersmoking the proper length of time and then heating quickly and evenly. Good judgment must be used in shifting the heat and draft. It is impossible to advise as to the quantity of dust to use, without being on the ground. The quantity of the clay, the size of the brick and whether soft-mud, stiff or dry press, would all make some difference. A poor quality will take the most, a rich clay that shrinks much in drying and burning will not stand much unless mixed with sand. Three pecks per thousand is a good standard, but it will not meet all requirements. The best way to

regulate the quantity is by using a certain number of shovelfuls to each load of clay. A special brick should be made and piled one side to be used as an outside course all around the kiln, inside the wall, and one high on top, under the platting. Kilns with thick walls will require but one running brick, if made strong. The walls should have a single block. These bricks should contain from three to four times as much dust as those in the body of the kiln and should be marked in some way so as not to get mixed with the others.

As to saving, Mr. Brown writes that he uses one-half cord of wood to burn 1,000 brick. We will take one of our ordinary sized kilns for a comparison consisting of 16 arches—46 M to each arch. We burn less than 6 cords of wood to an arch or 96 cords total, and not all hard wood either. Mr. Brown would require for the same sized kiln 23 cords per arch or a total of 368 cords. Quite a difference in cost and labor for only 736 M brick.

About three pecks of dust per M should be about 10 cents per M. If Mr. Brown gets his wood at $1.50 the difference would be $334.40—what would it cost us with wood at $5.00? We are now using hard coal, three tons for the same sized arch.

There is much more that might be covered in regard to burning, but it would not fit all places and conditions, and without some necessary data might be misleading. Emgee.

GO AHEAD, PHILIPPI!

Editor "Brick":—When our plant was originally put in, it was only intended for the purpose of manufacturing on a small scale, drain tile and brick. We made some drain tile. After running a day or two and making drain tile, brick attachments were put on the machine and quite a number of brick were made. and our first kiln of tile and brick was burned. While the tile was entirely satisfactory, yet greatly to our surprise, the brick were of such a superior quality that they immediately attracted attention and without soliciting business, demands for our brick became so heavy that we gave our undivided attention to the making of that product. We have never solicited an order for the sale of brick, but the demand grew to such a proportion that we have torn out all our original machinery, and have put in new appliances and a machine with a capacity of 3,500 brick per hour, have trebled our boiler capacity, and doubled our engine power, and are now starting to fill an order for four and one-half million of brick for the West Virginia Pulp & Paper Co., at Luke, W. Va., and Davis, W. Va. In the past summer we have "turned down" orders for brick, aggregating at least a million, simply because we were unable to fill the same. Of course you can see we have some pride in this plant for the reasons stated,—we have never solicited an order, and yet the orders have come to us by reason of the advertisement the brick gave themselves,—until we have a plant today instead of making 8,000 or 10,000 as originally intended, that makes 35,000 per day.

We will be pleased to give you at any time any information we can relative to the clay business, as we are of the opinion that great as the clay industries of this country are today, they are really in their infancy. We say this because timber is getting scarce, and people will soon have to face the fact that brick houses are better and cheaper than frame. Not only do we believe that the growth in the clay industry must increase with the building of houses of brick, but in all other lines. The Tygarts valley, in which we are situated, is very rich in its clay deposits, possessing all kinds of clay.

We may further add that if you have inquiries for locations in this industry, that if you will refer them to the Philippi Development Company, or to us, that we will be glad to give them any information we can; yet we recognize that the field is so great for industries of this kind, that we are in no wise selfish. Yours very truly,

Philippi Tile & Brick Company.

Philippi, W. Va.

MATERIALS FOR ENAMEL.

Editor "Brick": I am interested at the present moment in investigating the possibility of replacing imported materials used extensively in enameling with those of domestic production. In enamel industries very much the same materials are used as in the glass and pottery business, such as silica, feldspar, fluorspar, cryolite or baryta carbonate, china clay, ball clay, or any combination containing the elements entering into these materials, that are free from matter that gives color to the clay during smelting or muffle burning. I would like to investigate any minerals that could be substituted for the imported materials now used in the enamel business, and would be glad to have persons interested address me on the subject. Yours truly,

Dubuque, Ia. C. N. Hooper.

ALL TOGETHER!

Editor "Brick": I would like to suggest that all the manufacturers of brick machinery give an exhibition of their machines in practical operation at the St. Louis World's Fair. They could have a shaft running through the building and place the various machines side by side showing just what each can do. Also, the drier and kiln men could make an exhibit. What a treat it would be to brickmakers to see them all together. There has been only one exposition where the machinery of interest to our industry was so arranged. That was the Cotton Exposition at New Orleans in 1885 and there were then but five machines. At Chicago in 1893 there were only two dry press machines exhibited and the makers were not permitted to show the machines in operation. Yours truly, John K. Bickel.

Nebraska City, Neb.

Editor "Brick": Replying to your circular letter of the 21st, will say that we expect to make an exhibit of our clay product at the World's Fair, both for the Sewer Pipe Co., in the way of sewer pipe, culvert pipe, wall coping, flue lining and the like, together with the White Hall Stoneware Co., of white glaze stoneware, in the way of jugs, jars, milk pans, etc. Yours truly,

White Hall, Ill. White Hall Sewer Pipe Co.

Editor "Brick:"—We have your esteemed favor of the 21st inst., and note what you have to say about the clay exhibition at the World's Fair in St. Louis. We are greatly in sympathy with this movement, and are pleased to note that you have taken the subject up so early, and trust that you will succeed in your efforts to have a large and satisfactory exhibit from manufacturers of clay products. We shall be glad to co-operate with you in this matter, and shall be pleased to hear further from you at any time. Very respectfully,

Reese-Hammond Fire Brick Co.,

Bolivar, Pa. J. B. Hammond, Gen. Mgr.

Editor "Brick" We like your idea for clayworking exhibits at the St. Louis World's Fair in more ways than one, and will be pleased to be included in it. Our line, however, is exclusively for clay goods, principally muffles, crucibles, scorifiers and furnaces, for assayers' use and all kinds of special tile and firebrick for metallurgical purpose, locomotive and engine fire boxes, etc.

We probably have very little that could be used in the construction of the building you propose, though as to this we cannot say

definitely till we know more of the detailed plan. As we are manufacturers, jobbers and dealers in all kinds of assayers' and chemists' supplies the Mines Building would be most preferable for our exhibit. Yours truly, Denver Fire Clay Co.

Editor "Brick": In reply to your favor of the 21st inst. we beg to say that we would like to exhibit our assayers' clay goods, such as crucibles, muffles, etc., at the St. Louis Exposition in 1903. The space necessary for our display would be small, say 6 x 6 ft., and of course we are willing to stand our share of the expense. The idea of having the exhibit of clay goods in the Mines Building is quite correct. Yours truly,

Butte, Montana. Butte Sewer Pipe & Tile Co.

Editor "Brick": Answering yours of December 21st enclosing advance proof of your editorial on the proposed clay exhibit at the St. Louis World's Fair in 1903, we beg to advise you that we are fully in sympathy with your movement and will cooperate to the extent that we can afford. We presume that at this early date you are not prepared to go into matters of detail in regard to the buildings or exhibits. Wishing you success,

Yours truly,

Atlanta, Ga. The Atlanta Terra Cotta Co.

"BRICK" THE MOST PROFITABLE INVESTMENT.

Editor "Brick":—I inclose herewith one dollar for continuation of my subscription to "Brick." I consider it the most profitable one-dollar investment that I make and do not see why any clay worker would be without it unless they have reached a point where they can learn nothing more. With compliments of the season and wishing you and your journal continued success, I am, yours truly.

Sterling, O. R. T. Terry.

WHERE IS THE THIRD?

Editor "Brick": Having long been a reader of "Brick" I send you a dollar for another year; I find it very useful to me. You

READER, MR. KING IS TALKING TO YOU.

will be interested in knowing that the Boulder Shale Brick Association has been organized to erect a plant at Boulder, Col., and make pressed and ornamental brick, stiff-mud brick and sewer pipe. The officers are: A. W. Osborne of Denver, president; W. G. Sprague of Denver, vice-president; Ulrich Sprague of Victor, secretary; S. L. Garigher of Denver, treasurer and manager. Also, the Trinidad (Col.) Pressed Brick & Tile Co. is soon to install a stiff mud machine. Yours truly F. W. S. King.

Denver, Col.

(Mr. King has kindly remembered "Brick" with a photograph showing him at work as a press brick setter, an engraving of which is shown herewith.—Ed.)

OPPORTUNITIES IN THE SOUTH.

Editor "Brick": We wish to get in communication with parties desirous of engaging in tile and brickmaking in the South, and who would take stock in a company to manufacture finishing brick, terra cotta work, etc. Our clay is of a particularly fine quality and burns to a beautiful buff color, with absolutely no loss in drying. We own several hundred acres of this clay on a railroad and near where some large manufacturing plants estimated to cost $5,000,000, are to be erected. Realizing the demand that will be made for our product we wish to increase our capacity from 20,000 to 60,000 per day. To do this will require more capital than we have at our command, and we would be glad if those interested in the proposition would enter into correspondence with us.

Yours truly, A. & Z.

THE FUTURE OF ROOFING TILE.

Editor "Brick": It is very hard to see why clay workers in this country have never given proper recognition to the adaptability of clay to the manufacture of roofing material. The clays of Europe, where centuries of use have shown the many advantages of such roofs, are in no way better adapted to the purpose than our own American clays, but still, the business here is in its infancy—it might be said to have scarcely had its birth yet—for among all clay products in amount of production it stands lowest. A roof of no other material can claim so long a list of advantages as one constructed of properly made and burned tile. It is indestructible by the cold and frosts of the most vigorous climate or by the heat caused by the burning of adjacent properties. It cannot rot, as does wood, or corrode like metal, or check or scale as slate may. It is not, in fact, susceptible to any of the ordinary methods of attack by which time works its ravages. By its nonconductive properties it prevents the heating of apartments directly underneath in warm weather. Once on it needs no further care or attention. It admits of architectural effects of wonderful beauty and novelty. Yet, from motives of greater apparent cheapness, or induced by the misrepresentations of the producers of other classes of materials, or merely from lack of proper information as to its real merits, or often times from an "in the rut" conservatism, people continue to put on roofs open to some or all of these objections. Necessity is the mother not only of invention, but of change in general, and will in time attain results that mere desirability fails to produce. The failure of the forest supplies of wood and the fact that the amount of tin and slate available is necessarily limited by the extent of natural deposits, will in time force people to the use of clay. The demand then will be only measured by the number of new houses to be built or old ones to be re-roofed. This time, from present indications, is much nearer at hand than the situation a few years ago indicated. Difficulties in the manufacture of roofing tile arising from a lack of understanding the proper methods and correct processes have in the past caused some attempts in this field to end in failure, and this, of course, has reacted to somewhat retard the development. The time has come, however, when it presents no difficulties that ordinary business ability will not overcome, and clay workers who overlook this line of the business are neglecting one of the most promising and profitable parts of the clay working industries. Observer.

PEAT AS FUEL.

Editor "Brick": I note the article on "Peat as Fuel" in "Brick" for December, 1901, page 273, in which it is stated that Engineer Stauber, of Berlin, has perfected a process for pressing the peat into bricks and expelling the moisture. We have some extensive peat bogs in this part of the country and would greatly appreciate it if we could secure illustrations and descriptions of the machine. If the conditions permit of it we would like to put in a plant for the manufacture of fuel bricks.

Yours truly,

Armstrong, Ia. Wm. Stuart.

DOWN-DRAFT CONTINUOUS KILNS.

Editor "Brick"—I have been very successful of late in my experiments with down-draft continuous kilns and automatic draft regulators. I have recently filed several applications in the patent office. I have spent considerable time in perfecting a continuous system to be applied to the use of the down-draft kilns. This comprises six or eight kilns, either round or square, with coking furnaces. These kilns are connected by flues. After the first kiln is set and fired, the gases, instead of passing directly to the stack as is usual, are directed to the adjoining kiln, through the bags and down through the kiln in the usual manner. When the bricks are thoroughly dried by this advance warming, firing is commenced, the heat in the kiln being so intense that the mere introduction of the coal or other fuel, will insure its combustion. This proceeding is repeated from kiln to kiln. The advantages of this method of arrangement and construction are obvious. Great economy is effected in fuel consumption as no cold air can enter the kilns at any time, the ash pit and furnace doors being kept shut, firing being conducted through the coking furnace doors.

I believe that there is a great future for the down-draft kiln fired on the continuous plan. Yours truly,

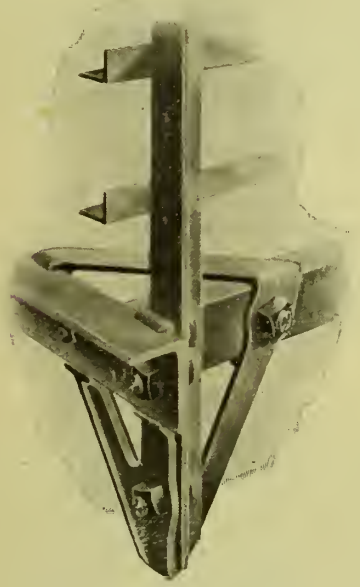
Madison, Neb. C. F. Kaul.

C. W. Wright, of Waco, O., contemplates establishing a pottery at South Bend, Ind.

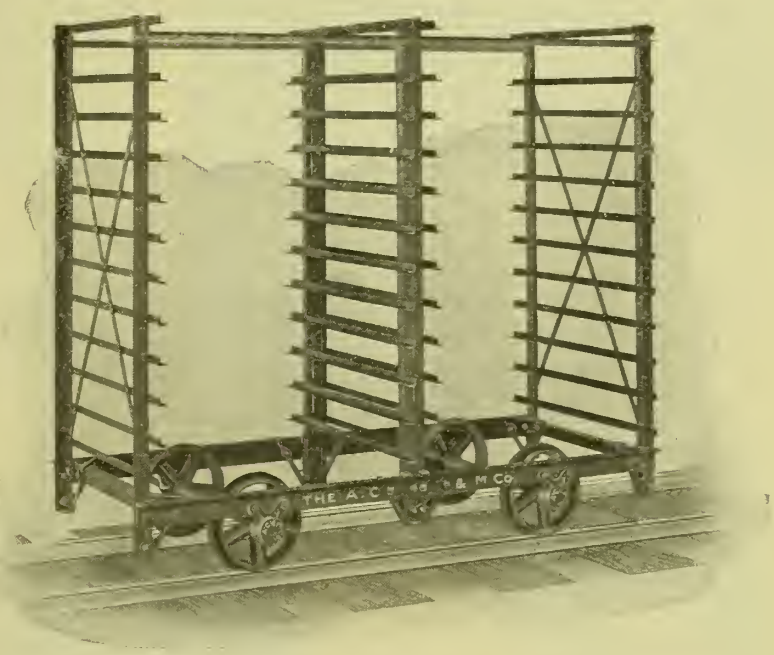
The "Atlas" Car.

The accompanying illustration shows a product which has been designed to meet the demand of brickmakers for more perfect machinery and particularly to give them a rack car that will not rack. A common sight is a car of bricks all tumbled together because the uprights swing endwise and sidewise and let the pallets fall off the slides.

The Atlas Car & Manufacturing Co. has a most enviable reputation for high-grade cars and all the devices which this company places on the market will be assured of consideration by the brickmaker. Our illustration shows the use of the "Wright" patent malleable bracket which is designed to combine simplicity with a maximum of strength and a minimum of weight. The bracket connects the side and end frame pieces in a rigid construction. The uprights rest on a recess, taking the bearing strain off the bolts. Also being bolted in both directions makes it impossible to work loose. The bracket is provided with lugs into which the angles fit tight, allowing no movement of bracket, either sidewise or endwise, thereby making the uprights rigid in every direction. The bracket is connected on top from both corners in such a way that it keeps the frame square and in alignment. The bodies of cars can be shipped set up. This bracket is used in double and triple deck cars, as well as on cars as shown. The bracket being made of malleable iron will stand all the strains and blows that such cars are subjected to. The approval which this construction receives from brickmakers is evident from the number of orders booked by the Atlas Co.



THE "WRIGHT" BRACKET.



THE "ATLAS" CAR.

The Atlas Car & Manufacturing Co., Cleveland, O., will be glad to correspond with all parties who contemplate the purchase of drier cars or who are having trouble with their cars.

W. P. Pinckard, who contemplates a firebrick factory at Birmingham, Ala., is making elaborate tests of the clays in the vicinity of that city.

H. A. Nelson, a prominent brick and tile manufacturer of Bristol, Wis., has removed his plant to Rolfe, Ia. The plant at Bristol has been purchased and will be operated by G. P. Willett.

Celadon Roofing Tile Co.

One of the most remarkable features of the rapid progress of the American clayworking trade during the last 10 years is the phenomenal advance of the roofing tile industry. Since the time of the World's Fair when there were several excellent exhibits of these products, their popularity has been constantly on the increase and we may add, that never before has there been such a variety and such excellence shown in the finished article as is observable today. It was our pleasure some time ago to make a flying trip to Ottawa, Ill., and inspect one of the plants of the Celadon Roofing Tile Co. The surrounding district is an extremely beautiful one. Ottawa itself, is a town of some 15,000 inhabitants, the streets are wide and fairly well laid out; several of these are paved with brick, while the tile sidewalks are the rule rather than the exception. There are also to be observed, several very handsome brick public structures.

VIEW OF THE CELADON ROOFING TILE PLANT.

The works of the Celadon Roofing Tile Co. lie two miles from the court house and are reached by conveyance, or, if one is fond of after-dinner exercise, on foot. It is not advisable, however, to use the latter means of progress in the winter time as the country roads are not of the best. These works were erected in 1890, two years after the completion of the company's main plant at Alfred, N. Y., but by parties not experienced in the clay shingle business and for that reason the history of the plant comprises a record of changes as it has passed through various hands; but under the present management everything has been extremely prosperous. The present officers of the company are: Charles T. Harris, president; William R. Clarke, first vice-president and treasurer; Henry S. Harris, second vice-president; E. L. Babcock, secretary; E. J. Hess, assistant secretary and treasurer, and A B. Clarke, general superintendent.

Mr. A. B. Clarke had charge of the Alfred factory from the time of its erection until he took his present position at Ottawa and now he has the general supervision of both plants. He is a man of varied and valuable experience, thoroughly acquainted with every part of the clayworking industry, conversant with every kind of machinery and an expert in kiln and drier construction, traces of his skill in this direction being visible throughout the plant.

The grounds of the company cover some 15 acres, and excellent shipping facilities are obtainable through the lines of the Rock Island and the Chicago, Burlington & Quincy railroads. Our first visit was to the shale bed of a very fine specimen of shale which is of a grayish blue color, hard as adamant, and it is mined by blasting. The full face of the shale is about 60 ft. As to the extent of the raw material available for the operation of the company it would be impossible to estimate. As Mr. Charles T. Harris said as he courteously showed us over the works at which he happened to be on his regular visit from New York: "There is enough shale here for ourselves in our lifetime, for our children and for our grandchildren, and further, we do not trouble any." This is sound philosophy and satisfactory to the grandchildren.

There is one large, main building built of brick four stories in height, there is a large drying room of two stories on one side of it, and four drying tunnels in the rear. These tunnels are 100 ft. in length and are warmed by direct heat from the kilns, the circulation of the hot air is effected by a fan 6 ft. in diameter, driven by a small 15-h. p. Erie engine, the steam for which is obtained from the main boiler. There is a 100-h. p. Atlas engine supplied with steam from a battery of two boilers of 125-h. p., carrying from 80 to 100 lb. pressure.

The fuel used throughout the plant is coal—LaSalle coal being used for steaming purposes and Streator coal for burning. The works are also fitted with a completc installation for burning oil at any time and the cheapness of oil at the present moment, owing to the recent discoveries in the Texan and other oil fields, may possibly induce the changing of the fuel at some not remote date.

There are three kilns in operation, all of them giving excellent results. The efficiency in operation of each is due entirely to the ability of Mr. Clarke. The first in order is a splendid continuous kiln of 16 chambers. The chambers are 8 ft.x8 ft. in dimension and they have an average capacity of 20,000 brick. There is the

E. J. HESS.

HENRY S. HARRIS.

A. B. CLARKE.

usual set of underground flues and the draft is provided by a brick stack 100 ft. in height. Close by are two large square Grath kilns, each with a capacity of 50,000 fitted out with Grath coking tables and working very satisfactorily indeed. The poorest kind of slack may be used with this table, and Mr. Clarke informs us that the

FRANK S. COOPER AND JOHN OTT.

product will show an even burn and a very small percentage of loss.

The Grath kilns burn and cool in about 10 days and the continuous kiln yields as a rule a little over a chamber a day.

There is a large stack 75 ft. in height, built of fireproofing, supplying the need of the boilers. In addition to the four direct heat tunnel driers there are seven other dry rooms inside the two-

INSIDE THE CONTINUOUS KILN.

story brick additions whose heating is effected by steam. The ware here is packed three courses high on racks. Mr. Harris speaks, however, most emphatically in favor of the direct heat system of drying and gave us to understand that it was highly probable that in the spring a complete revolution may be effected and the direct heat method employed throughout the plant. These steam driers take care of the products of the hand press and the trimmings from the terra cotta department.

The ware is taken by barrow to the steam driers and by car to the tunnel driers. These drier cars were furnished by the Atlas Car Co., of Cleveland, O. We were further informed that the direct heat method dried the ware in a third of the time required by the steam drier.

The shale is taken from the bank direct to a 9-ft. dry pan of the American Clayworking Machinery Co.'s make, and from there it is carried by belt elevators to the screen on the fourth story. The clay is screened by a special process devised by Mr. Clarke and it is considered more effective and economical than by the employment of revolving or oscillating screens. From the screen it is deposited into a storage bin, and descends by gravity to a Bucyrus pugmill, and from there to a slab machine, where it is cut into the proper sizes for the press according to the different size and shape of the tile required at the time.

There are two power presses, one of which, made by D. J. C. Arnold, is a revolving roofing tile steam press. There are also

THE HAND PRESS IN OPERATION.

two hand-presses which are used for the smaller products of the plant.

The products of the plant are quite varied and include several styles which are growing very popular at the present time. We refer to the French "A" style, the French "B," the smaller size of the "A" type, for dwelling houses, etc., the Inter-Ocean, flat shingles 6 in.x12 in., and the so-called Spanish tile in "S" shape and the Old Roman and the Old Spanish.

Work is carried on the whole year through and the force of the yard comprises some 60 men. Mr. Harris was complaining that there was not enough stock on hand to enable him to fill all the orders he has in sight. This seems to be a very healthy state of affairs, not to be commented upon adversely by anybody. There is a great unity of feeling amongst the workers at Ottawa, and the perfect good will between the employers and the employes was very satisfactory to observe.

The combined capacity of the two plants at Ottawa and Alfred places the Celadon Roofing Tile Co. as the largest producer of roofing tile at the present time in the United States and its product is of the finest.

On glancing at the illustrations obtained on this trip to Ottawa the reader will notice the photograph of a giant. We well know from the Biblical statement that "there were giants in those days,"

but it appears that the race of giants is not yet extinct as will be verified by the inspection of the photograph of John Ott, who is the chief burner for the company. He stands 6 ft. 4 in. in his stocking feet, and considerably more according to the thickness of the boots he may have on at any particular time. He was formerly one of the German Emperor's bodyguard, and is probably the tallest burner in the United States. If there are any others taller, "Brick" would be glad to know of them. He is very much liked by the other employes and is respected by his employers. He is easily able to lift with one hand what is a task for the ordinary man with two.

The gentleman on the left in the picture is Mr. Frank S. Cooper, Mr. Clarke's assistant superintendent, and a graduate of the Ottawa Business College. He is a comparatively young clayworker, but exceptionally skilful at his craft and has won the confidence and esteem of the officers of the company and all those with whom he comes in contact.

Charles T. Harris, the president and chief executive officer of the company, has the general management of the western territory and Ottawa plant as well as of the chief industrial center at Alfred. Some interesting details of his clayworking career will be given in a future article on the Alfred plant. Mr. Harris has a genial personality and possesses an inexhaustible fund of practical clayworking knowledge.

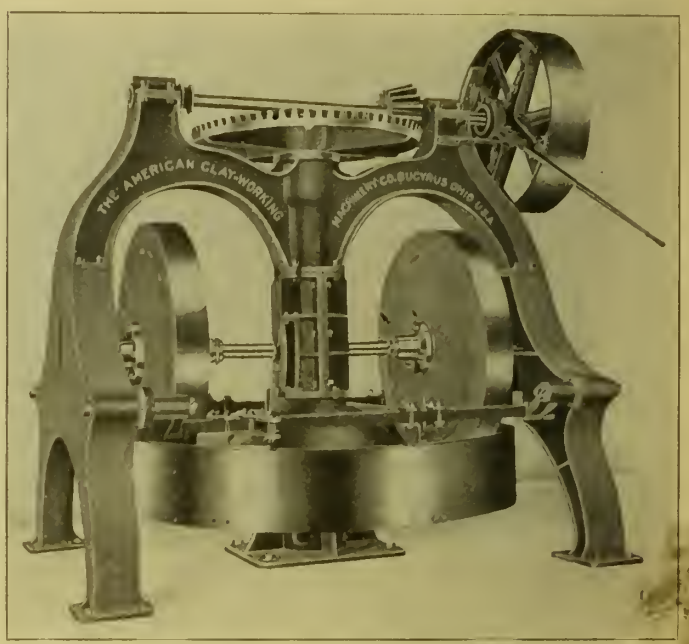
Henry Hess Harris, the western manager of the Celadon Roofing Tile Co., has been identified with the clay businness since 1895, in connection with Charles T. Harris & Co., that company handling brick, terra cotta and roofing tile products. Here he remained till the company's dissolution, when he became an officer and director of the Celadon Roofing Tile Co. Mr. Harris is a deep thinker, of resolute character and is in the clay business with one aim only—success.

Edwin J. Hess, assistant secretary and treasure of the company, started the manufacture of fire brick and paving brick with his father in 1890, continuing in that branch of the clayworking industry till 1896, when he purchased the roofing tile plant at Ottawa, afterwards sold to the Celadon Roofing Tile Co. in 1898. Immediately after this event Mr. Hess removed to the Chicago office, filling this position with the same energy as he manifested in the manufacturing end of the business.

Balanced Ball Bearing Anti-Friction Wet Pan.

This pan, which is one of the latest products of the American Clayworking Machinery Co., of Bucyrus, O., was designed especially for tempering and grinding stiff, stony or pebbly clay, reducing the stones or pebbles and thoroughly mixing them with the clay. It is evenly balanced and the ball-bearing feature insures more work with less power than with ordinary construction.

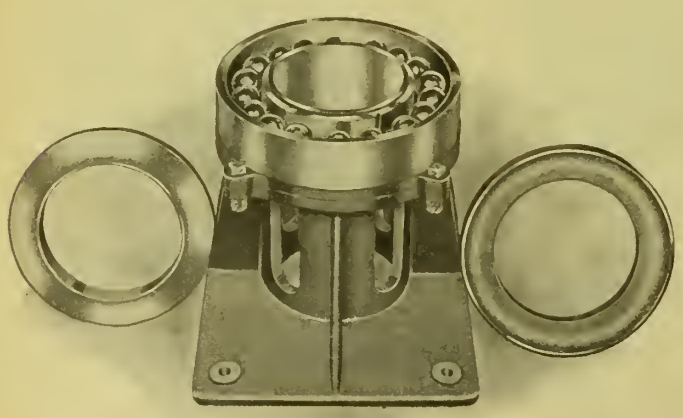
The frame is neat, symmetrical and strong in design and construction. The mullers are of large diameter and narrow face,



ANTI-FRICTION WET PAN.

which with their great weight, give them great grinding and crushing capacity. The pan revolves on ball bearings, the ball races being 24 in. in diameter and so designed as to give the balls the maximum bearing surface. The balls are 18 in number, and 3 in. in diameter. The pan has an upward projecting hub into which is inserted the upper half of the ball race, a heavy pedestal carrying the lower half. The pedestal extends up into the hub forming the step.

The bottom of the pan, carrying the wearing plates upon which the mullers revolve, hangs below the ball bearing. The ball races being of large diameter and the mullers, being spaced equi-distant from the center, balances the pan and throws the greater part of the load on the ball bearings, relieving the frame, which carries the vertical shaft and driving gears, from side thrusts and undue strain and also reduces the power required to the minimum. The entire pan is strongly built and will do work that an ordinary wet pan could not touch and with far less power. The mullers are constructed with a bulged center to give extra weight. They are 60 in. in diameter and 7 in. face, their weight being 6,000 lb. each. The width of face can be increased to 12 in. if desired. The friction clutch of driving pulley is 42 in. in diameter and has a 12-in. face. The speed is 150 r. p. m. The floor space required is 10 ft. 4 in. by 8 ft.; height to center of driving shaft, 9 ft.; weight, 31,800 lb. If desired this pan can be furnished with the company's regular.



BALANCED BALL BEARING.

The Federal Brick Co., of Hites, Allegheny, Pa., has been incorporated with a capital stock of $20,000.

The Beecher W. Bennett Brick Works at Muncie, Ind., were destroyed by fire, followed by a gas explosion, on December 19th. Beside the buildings and machinery, 800,000 brick were destroyed, the loss aggregating $10,000 with insurance to the amount of $7,000.

TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY

REPRINT FROM VOL. II. OF THE "TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY 1900"

NOTE ON THE RELATION BETWEEN THE TENSILE STRENGTH OF CLAY MIXTURES AND THE SIZE OF THE GRAINS OF THEIR NON-PLASTIC CONSTITUENTS.

By Edward Orton, Jr., E. M., Columbus, O.

PART II.

(Continued from Vol. 6, page 271.)

The Drying and Breaking of the Brickette.

The brickettes after manufacture were placed on boards the surface of which had been previously sprinkled over with powdered flint, so that as they dried they would have no tendency to stick fast to the board and thus introduce weakening strains in the drying process. They were dried in an open room, whose average temperature is about 70 degrees F., and reaches 80 degrees occasionally during each 24 hours. When they had become as dry as possible in this atmosphere, which took several days, they were placed in an air bath, such as is used in any chemical laboratory, and heated to a temperature of 120 degrees C., for several hours, by which the hygroscopic water was expelled. By previous experiment it had been found that this precaution of thorough drying was a very essential step in determining the tensile strength, and that air-dried mixtures would frequently show only one-half the tensile strength, that they would develop after drying in an air bath for an hour or two. It did not seem necessary that the drying should immediately precede the breaking of the brickette, but a total expulsion of free water at some stage in the drying seemed to exercise a hardening effect upon the mass as a whole, by which it gave much increased figures in the testing machine.

The testing machine employed was a home-made one, designed and erected by Professor C. N. Brown, of the Department of Civil Engineering of the Ohio State University. In brief it consisted of a long lever balanced on knife edges and with easily adjusted counter poise, by which it could be maintained in equilibrium. At the further end of the beam, a funnel-shaped can was hung, and above this can was fixed a water pipe provided with a valve which was opened only at the will of the operator, but which was instantly closed by the descending beam when the test piece under examination broke. The weight of the water which was required to break the test piece was then ascertained by tapping it out from the conical can into a receptacle beneath, set on the platform of a good scale.

The weight of the water obtained in each test was converted into pounds of tensile strength by a calibration table, running from 0 to 1000 lb. per sq. in.

The clips which held the brickette were located close in rear of the knife edges on the principal beam. These clips were the least satisfactory part of the apparatus; they did not exactly fit the angle or slope of the brickette, and tended to exert a pinching strain, which often caused the brickette to break in the clip instead of breaking at the narrowest point of cross section. This difficulty was obviated to a large extent by the use of soft rubber cushions between the side of the brickette and the jaws of the clip; but even with this help, considerable trouble was had. For extended tests, special clamps for holding these soft brickettes of unburned clay would have to be prepared.

The general character of the pull exerted by this machine was very much more satisfactory than that obtained from a regular Riehle cement testing machine. In the latter, the increments of strain were put on by the movement of a hand-screw and counterbalanced by sliding a weight out upon the beam; under such conditions the slight fluctuations or increases in pressure frequently would break a brickette which gave every indication of being able to stand a higher test, if the pressure could be applied with absolute uniformity.

The work of breaking the brickettes and recording their strain was in the main satisfactory, but from the following tables it will be seen that there were some results in each series which were not satisfactory. In some cases, flaws were found in brickettes which had given excellent tensile strength; in others, no flaws were found in brickettes which broke easily. But from the number of brickettes broken in each set it is believed that a fair average has been attained. In tables 2, 3, 4, 5, 6, 7 and 8 are grouped the data of the tensile tests.

The relative relation of these quantities can be grasped more easily by a glance at the curve shown in Fig. 2.

The signification of these few facts admits of various constructions. The first and only indisputable deduction is as follows:

That the tensile strength of mixtures of a plastic ball clay with equal quantities of non-plastic sands will vary inversely with the diameter of the grain of the sand, between the limits of .04 inch and .002 inch.

That is, the mixtures become stronger, the finer the sand is made, inside of these limits.

This accords with the theory laid down in the early part of the paper, though, of course, no one would regard the theory as established by so slender a proof as this one investigation.

But, according to this theory, the strength should still continue to gain as the fineness increased, after passing the limit of .002 in. diameter of grain. Likewise the strength should also increase as the size of the grain still increases over .04 ins.. and passes into the coarse grains used in the form of grog in many branches of clayworking. On this latter point we have no data, and hence no farther arguments to bring forward.

But in the former case we have data, and they can in no wise be construed as confirmation of the theory advanced.

By this theory, the tensile strength of the sixth mixture, which

contained grains about ten times finer than the fifth mixture, should have shown a distinct gain; whereas it lost about 28 per cent of the strength shown by No. 5.

Three explanations of this are possible:

1.—That the results of No. 6 were faulty and should be rejected. Not the slightest reason can be found for this assumption except the results themselves, and it is therefore dismissed as untenable.

2.—That in fine-grained clay mixtures, the conditions of drying which were used satisfactorily with the coarse sands are no longer suitable, and therefore that the tensile strength of the brickette may be reduced by incipient cracks or drying strains, so that the results no longer represent the real effect of the fine materials.

TABLE 2.

Tensile Tests on Clay Mixture No. 1.

Composed of { Kentucky Ball-Clay..... = 50%
Sand No. 1 (Diam. .0364) = 50%

Number of the Brickette.	Dimensions of the Brickettes at Smallest Point. Breadth in inches	Thickness in inches	Area of Minimum Cross-Section in square inches.	Actual Breaking Strain on the Brickette.	Breaking Strain per square inch of Cross-Section, pounds.	Fluctuation of Results in percent of Average Tensile Strength.	Character of the Fracture.	Remarks.
1	1.000	.953	.953	78.13	81.90	— 19.5	.....	
2	.984	.953	.938	98.14	100.36	— 1.93	.....	
3	.984	.953	.938	91.31	97.35	— 4.87	.....	
4	.984	.969	.953	89.43	93.80	— 8.34	.....	
5	1.000	.969	.969	112.97	116.50	+13.80	.....	Maximum Strength = 116.50 pounds.
6	1.000	.953	.953	108.26	113.60	+11.00	.....	Range of Fluctuation = 33.8 per cent.
7	1.000	.953	.953	111.08	116.50	+13.80	.....	
8	1.000	.969	.969	96.02	99.09	— 3.17	.....	
9	.984	.953	.938	96.96	103.37	+ 1.02	.....	
10	1.000	.969	.969	96.96	100.06	— 1.24	.....	
11	....	....	...	.....	.....	.....	.....	
Average.....			.953	97.63	102.33	± 7.92	.....	

TABLE 3.

Tensile Tests on Clay Mixture No. 2.

Composed of { Kentucky Ball Clay.....=50%
Sand No. 2 (Diameter .0114)=50%

Number of the Brickette	Dimensions of the Brickette at the smallest point. Breadth in inches	Thickness in inches	Area of Minimum Cross-Section in Inches	Actual Breaking Strain on the Brickette	Breaking Strain per Square Inch of Cross-Section, pounds.	Fluctuation of Results in per cents of Average Tensile Strength	Character of the Fracture	Remarks.
1	.984	.938	.923	107.32	116.27	+4.89	.....	
2	1.000	.938	.938	96.96	103.37	—5.85	.....	
3	.984	.938	.923	96.96	105.05	—5.25	.....	
4	.984	.938	.923	114.85	124.43	+12.25	.....	
5	.984	.938	.923	53.66	58.14	—47.60	.....	Maximum Strength =128.50 pounds.
6	.984	.953	.938	84.72	90.32	—18.63	.....	Range of Fluctuation =63.95 per cent
7	.984	.953	.938	112 02	119.43	+ 7.75	.....	
8	.984	.938	.923	117.67	127.20	+14.78	.....	
9	.984	.938	.923	118.61	128.50	+15.95	.....	
10	1.000	.953	.953	117.67	123.32	+11.25	.....	
11	.984	.953	.938	115.79	123.35	+11.20	.....	
Averages.....			.931	103.29	110.85	±14.12	.....	

3.—That the theory is wrong, and that excessively fine-grained mixtures do not develop great tensile strength. Facts may be brought up in support of either of those two latter propositions.

In the opinion of the writer, the second explanation has more in its favor than the third, and as a basis for this opinion, the following reasons are submitted:

1.—The same lot of ball clay has been tested a number of times by different persons, and has invariably given low tensile tests when worked up by itself. For a clay of immensely fine grain and the highest degree of plasticity, this is remarkable, as theory would lead us to expect the exact reverse.

2.—The same lot of ball clay has been mixed with various quantities of grog, using on one occasion a very coarse material and in another test a grog whose grains would be in the neighborhood of sands Nos. 3 and 4 of the present series. But both tests developed the fact that the clay showed increasing tensile strength with additions of grog, until about 30 per cent had been added, when the tensile strength began to fall away in a regular manner with each further addition.

We have a clay, therefore, that shows less strength when pure than when moderately adulterated, but which weakens with increased adulterations. The explanation which most naturally presents itself is that we fail to reach the full or real strength of the pure clay, but that on opening up its structure by small quantities of grog, we permit it to dry safely without incurring weakening strains, so that the actual strength of the diluted clay is greater than that part of the strength of the real clay which ordinary drying drying retains.

If this explanation, which is backed up by the evidence of the only other fine-grained clays tested, is accepted, then it follows that the strength of the No. 6 mixture is not fairly represented by the tests, and that the same law already laid down really holds for limits of fineness far greater than those given.

This must be proven before it is accepted. The obvious line of attack of the problem is to guard the drying conditions in the next series, and remove the water from the entire series at a rate in-

TABLE 4.

Tensile Tests on Clay Mixtures No. 3.

Composed of { Kentucky Ball Clay ..... = 50%
Sand No. 3 (Diameter .0064) = 50%

Number of the Brickette.	Dimensions of the Brickettes at smallest part. Breadth in inches.	Thickness in inches.	Area of Minimum cross-section in inches	Actual breaking strain on the Brickette.	Breaking strain per square inch of cross-section, pounds.	Fluctuation of the Results in percents of Average Tensile strength.	Character of the Fracture.	Remarks.
1	.984	.922	.908	94.14	103.68	—17.80	.....	
2	.984	.938	.923	82.84	89.75	—28.80	.....	
3	.984	.969	.954	115.79	121.38	— 3.71	.....	
4	.969	.953	.923	148.74	161.11	+27.80	.....	Maximum Strength =161.11 pounds.
5	.969	.953	.923	104.49	113.10	—10.30	.....	Range of Fluctuation = 56.6 per cent.
6	.969	.953	.923	109.20	118.31	— 6.13	.....	
7	.969	.938	.908	112.97	124.42	— 1.63	.....	
8	.984	.938	.923	145.91	158.09	+25.40	.....	
9	.984	.938	.923	119.56	129.56	+ 2.79	.....	
10	.984	.953	.938	121.44	129.47	+ 2.56	.....	
11	.984	.938	.923	128.03	138.70	+10.55	.....	
Average.....			.924	114.83	126.05	±12.45	.....	

TABLE 5.

Tensile Tests on Clay Mixture No. 4.

Composed of { Kentucky Ball-Clay.....=50%
Sand No. 4 (Diameter .0038)=50%

Number of the Brickette.	Dimensions of the Brickettes at their Smallest Part. Breadth in inches.	Thickness in inches.	Area of Minimum Cross-Section in inches.	Actual Breaking Strain on the Brickette.	Breaking Strain per square inch of Cross-section, pounds.	Fluctuation of the Results in percents of the Average Strength.	Character of the Fracture.	Remarks.
1	.969	.953	.923	112.97	122.40	—26.90	.....	
2	.969	.938	.908	132.73	146.18	—12.25	.....	
3	.969	.938	.908	154.39	168.93	+ 0.89	.....	
4	.969	.953	.923	161.92	175.43	+ 4.78	.....	Maximum Strength =189.70 pounds.
5	.969	.953	.923	165.68	179.50	+ 7.18	.....	Range of Fluctuation = 40.2 per cent.
6	.969	.938	.908	171.33	188.70	+12.70	.....	
7	.969	.953	.923	134.62	142.53	—14.86	.....	
8	.969	.922	.893	157.21	176.25	+ 5.27	.....	
9	.969	.922	.893	164.74	184.70	+10.30	.....	
10	.969	.953	.923	175.10	189.70	+13.30	.....	
	....	....	....	.....	.....	.....	.....	
Average.....			.912	153.06	167.43	±10.94	.....	

TABLE No. 6.

TENSILE TESTS OF CLAY MIXTURE No. 5

Composed of { Kentucky Ball Clay... ....=50%
Sand No. 5 (Diameter=.0016)=50%

Number of the Brickette	Dimensions of the Brickettes at their smallest part. Breadth in inches	Dimensions of the Brickettes at their smallest part. thickness in inches	Area of Minimum Cross-Section in inches	Actual Breaking Strain on the Brickette	Breaking Strain per square Inch of Cross-Section, pounds.	Fluctuations of the Results in per cents of the Average Strength.	Character of Fracture	Remarks.
1	.984	.922	.908	141.21	155.55	—10.73	.....	
2	.984	.922	.908	162.86	175.00	+ 0.48	.....	
3	.984	.938	.923	156.27	169.25	— 2.87	.....	
4	.984	.938	.923	165.68	179.44	+ 2.98	.....	Maximum Strength =195.75 pounds.
5	.984	.922	.908	176.04	193.85	+11.25	.....	
6	.984	.953	.938	160.63	167.75	— 3.72	.....	Range of Fluctuation =31.44 per cent.
7	.984	.938	.923	129.91	140.75	—19.20	.....	
8	.984	.922	.908	153.44	169.00	— 3.01	.....	
9	.984	.938	.923	177.92	192.80	+10.65	.....	
10	.984	.953	.938	165.68	176.55	+ 1.32	.....	
11	.984	.953	.938	183.57	195.75	+12.24	.....	
Averages			.922	161.15	174.74	± 7.13	.....	

TABLE 7.

TENSILE TESTS OF CLAY MIXTURE No. 6.

Composed of { Kentucky Ball Clay.....=50%
Sand No. 6 (Diameter .00017)=50%

Number of the Brickette.	Dimensions of the Brickettes at their Smallest Part. Breadth in inches.	Dimensions of the Brickettes at their Smallest Part. Thickness in inches.	Area of Minimum Cross-Section in inches.	Actual Breaking Strain on the Brickette.	Breaking Strain per square inch of Cross-Section, pounds.	Fluctuation of the Results in percents of the Average Strength	Character of the Fracture.	Remarks.
1	.984	.922	.908	106.38	117.08	— 7.70	.....	
2	.984	.938	.923	141.21	153.00	+20.60	.....	
3	.984	.906	.892	107.32	120.00	— 5.28	.....	
4	.984	.938	.923	113.91	123.40	— 2.72	.....	
5	.984	.906	.892	100.73	112.93	—10.97	.....	Maximum Strength =163.19 pounds.
6	.984	.938	.923	150.62	163.19	+28.65	.....	
7	.984	.938	.923	119.56	129.53	+ 2.11	.....	Range of Fluctuation =54.67 per cent.
8	.984	.938	.923	118.61	128.50	+ 1.30	.....	
9	.969	.922	.892	106.38	119.26	— 5.98	.....	
10	.984	.938	.923	86.61	93.83	—26.02	.....	
11	.984	.938	.923	124.26	134.63	+ 6.14	.....	
Average.....			.915	115.95	126.85	±10.68	.....	

Interpretation of the Results.

The preceding results when reduced to their lowest terms are shown in the following little table:

TABLE No. 8.

Number of Clay Mixture.	Average Diameter of Non-plastic Grains.	Average Tensile Strength.
1.....	.0364	102.33
2.....	.0114	110.85
3.....	.0064	126.05
4.....	.0038	167.43
5.....	.0016	174.24
6.....	.00017	126.85

capable of creating any such defects as we believe were created in this test. This may be done in several ways: Simple protection from air currents by a cloth would be the simplest expedient. Drying in a covered but porous box would be the next plan to be tried. Drying in an air-tight tin box, over $CaCl_2$ or H_2SO_4 would be another. If the drying period were extended so as to cover two or three weeks, it would seem as if all risk of weakening would be avoided. And it is anticipated that a test executed with these or equivalent precautions, will show that the strength of a clay is proportional to the fineness of grain of its non-plastic matter.

Discussion.

Prof. H. A. Wheeler: This is a very valuable contribution by Prof. Orton, and every clayworker ought to feel grateful for the very thorough, comprehensive and scientific manner in which he has treated the subject.

It is a very satisfactory way of getting at the plasticity, if done carefully. His results are very satisfactory up to the point in which the curve takes a sudden drop. As the drop is very great, and the particles are extremely fine, the brickettes may have been injured by drying too fast, and their tensile strength thereby greatly impaired. I have found with Missouri clays, where they are reasonably coarse, I could test the brickettes ordinarily after two or three days' drying in the air. With some coarse clays it was immaterial whether we tested them after air-drying only, or put them in a heater and thoroughly dried them before trying the tensile strength, but the weakening action of three or four per cent moisture is serious on fine clays.

I found in the loess clays, which were comparatively low in clay substance and very high in silica, though most of the silica is very fine, that they give relatively very high tensile strengths, way beyond what could be expected from the amount of clay substance present. I found in the gumbo clays—which were extremely fine, probably the finest in nature, though low in clay substance, as it rarely amounted to forty per cent (the balance being sand)—I found they had a tensile strength of three and four hundred pounds to the square inch; they were nearly as strong as portland cement. But to obtain this high tensile strength, it was necessary to dry the brickettes very slowly, keeping the brickettes covered with paper, and requiring two to three weeks to obtain a sound, dry brickette, as, if dried more rapidly, the gumbo clays were apt to more or less check. I think if Professor Orton had covered the brickettes of his pure, very fine-clay, with a porous cover, like cloth or newspaper, so as to effectually keep off all draft, which would insure slow, regular drying, that they would then show the highest tensile strength of all, or his curve would continue to ascend, instead of suddenly descending, and thus our theory of plasticity would be further substantiated by thus more carefully making the tests on brickettes that had not been injured by too rapid drying. But he certainly is on the right clue when he mentions the difficulty of drying that fine stuff. The fact that the raw or pure clay varies so greatly, shows that he was handling a very dangerous clay for an experiment of this kind. Professor Orton's results, however, are very valuable to every clayworker, and the care with which he arrived in the first place at the quality of the sand showed beyond question that he is presenting a maximum condition for favorable results.

Edward C. Stover: Is it your opinion that if the pure clay bricks were carefully dried and covered, that the tensile strength curve would also continue to go upward? I mean, would the bricks which showed the greatest strength with 30 per cent of sand be weaker than the pure clay bricks, if the latter were properly dried?

Prof. Wheeler: Yes, sir; pure clay is stronger than when diluted with sand. For although he has apparently improved the strength of the clay by adding sand, he has unfortunately taken a clay that is naturally difficult and dangerous in drying, and has seemingly improved the strength by opening up the pores, and thus rendered the drying much safer. But if he will dry the pure clay in two or three weeks with a cover, I think the raw clay is stronger than the diluted.

Dr. Heinrich Ries: I have listened to this paper with a great deal of interest and I do not think we ever had a finer contribution to the physical qualities of clay than this one. I will ask Professor Orton how much variation there was in the tensile strength, in

using these different sized grains, if he remembers it. What is the average? It is interesting to know.

Prof. Orton: There were ten or eleven brickettes broken in each series, and their average was taken. In mixture No. 1, the highest strain endured by any brickette was 116.50, and the range of fluctuation was 38.8 per cent.

In No. 2 mixture, the highest breaking strain was 128.50; the range of fluctuation, 63.95 per cent. In No. 3 the maximum tensile test was 161.11; range of fluctuation, 56.6 per cent. In the No. 4 the highest breaking strain was 189.75. I have neglected to calculate the fluctuation, but it was about 40 per cent. The No. 5 gives a fluctuation and range of only 31.44 per cent from high to low. No one who has not done some work in this line knows the tremendous desire that overcomes one to throw out a terrifically bad result when he gets one. It takes a good deal of moral courage to put the bad figures in.

Prof. Ries: I can sympathize with what Professor Orton says about the trouble he has had in testing these brickettes. I have had trouble along these lines, and it is curious what an effect the shape and size of the clips have on the way in which the brickettes break. I have tried several different forms and feel that I now have one which works fairly well, but am not yet wholly satisfied with it. I will ask Professor Orton whether he tested the brickettes as soon as he took them out of the hot-air bath.

Prof. Orton: We tested them the same day, and all within two or three hours. To make sure of the whole thing, after they had been dried and stood in the laboratory for a long time, we finally put them in the air-bath at 4 o'clock one morning and dried them until 10 a. m., and then took the whole lot across the campus to the testing machine and broke them.

Dr. Ries: You did not leave them standing out in the room?

Prof. Orton: No; we were afraid of them absorbing moisture and wanted to make their condition uniformly dry.

Dr. Ries: It has seemed to me that if a portion of the brickettes were tested as soon as taken out of the hot air bath, while others were allowed to stand a few days there will be a difference in the average strength of the two sets, for if the atmosphere is at all moist they will absorb some moisture from the air, thus softening up the brickette again and weakening it. The presence of organic matter also increases the tensile strength.

Prof. Orton: What form of organic matter?

Dr. Ries: Any form of fine fibrous matter. It seems to me the fibers might bind the particles together.

Prof. Orton: Are they small enough to pass a 150 screen?

Dr. Ries: Yes.

Prof. Orton: I doubt whether fiber that would pass a 150 screen would have any appreciable influence on the bonding quality of a clay.

Mr. Stover: I will ask Dr. Ries if he ever made any experiments along the line of trying to increase the plasticity by the addition of organic matter or any other substance in the clays? I have heard that it could be done, though I never tried any experiments on that line myself

Dr. Ries: I have tried very little; in fact, so little that I would not want to risk an opinion.

Mr. Stover: It would be a valuable point for the potter if something of that kind could be developed.

Dr. Zimmer: This was a very interesting paper of Professor Orton, and it has opened a field for interesting discussion. I will only cite an example for practical work, to show that very fine-grained sand will weaken the strength of a brickette or clay body by the strain it has to sustain during the drying process.

Our factory was first to introduce dry ground flint. Chemically, the dry ground flint was about the same as the wet ground flint we used before. In both cases, it was a very pure silica, about 99 per cent. As soon as we introduced the dry ground flint into our clay ware, we found we had a larger per cent of ware cracked on the molds. I investigated it very thoroughly and found that the outside, especially of thick articles—for instance, wash-bowls, etc., shortly after being made was already pretty dry, while inside the state of the body was almost damp yet. Then I examined our flint under the microscope and compared the wet ground flint we used before with the dry ground flint we were trying to use, and I found that the wet ground flint was in particles that were about three times as large as most of those in the dry ground flint. I had no means to measure it exactly, but the dry ground flint contained a very large percentage of those fine particles. My idea was that these fine particles stop up the pores of our clay body, consequently the drying process would take place much quicker on the surface than inside, as the pores were not open wide enough to furnish sufficient channels to the interior of the body to cause even drying of the article through the whole body. We were, in fact, obliged to abandon the use of dry ground flint on certain articles, and I could not give any other reason than the strain the body had to sustain in the drying process, caused by the stopping of the pores in the body by these exceedingly fine particles of the dry ground flint.

Mr. Mayer: When you changed from the wet to the dry ground flint, did you make any substantial difference in the weighing of the two substances?

Dr. Zimmer: Wet ground flint contains from 10 to 15 per cent of moisture; of course, we always made allowance for that. Dry ground flint has about 3 per cent moisture.

Mr. Mayer: It may safely be said that over 90 per cent of the potteries are using dry ground flint, and I never heard of any trouble in the direction Dr. Zimmer speaks of.

I have always had a theory that the great difference in temperatures between English and American biscuit kilns can only be accounted for by the difference in grinding in the two countries. In England they go to cone five per biscuit; we go to cone eight or nine. Our average feldspar is softer—very much softer—than their Cornish stone, and as regards ball clay, many of the American potters use English ball clay in about the same proportion as the English potters; but their flint and Cornish stone are ground very fine—very much finer than ours—as I have repeatedly demonstrated. The china clays and flint, as far as fire-resisting properties are concerned, are practically the same.

The Chair: Dr. Zimmer, do you say that dry ground flint is finer ground than wet?

Dr. Zimmer: Not uniformly finer, but it contains more fine particles than wet ground. With some kinds of clays, dry ground flint can be readily used. In making pottery at our plant we have so much flint in the body that an excess of those fine particles naturally will be detrimental to successful manufacture.

Mr. Gates: I want to ask Prof. Orton whether there was any appreciable difference in shape in the particles of non-plastic matter which he used; whether all were equally jagged, sharp particles of sand, or whether there were more round, smooth particles as the sizes became finer.

Prof. Orton: Well, I suppose the finer particles may be said to have a less jagged exterior than the coarse ones, because the coarse ones were composed of clay and quartz grains, and by looking at the microscope at the coarse sizes, we could see the bright particles of quartz cemented together by the red masses of clay substance. But the finer the sizes became the less likely they were to be composed of more than one kind of matter, and for that reason were a little smoother in contour.

Mr. Gates: Our grog is coarse and angular. At one time I thought I had made a very important discovery in using a quartz sand which was brought to my attention, but I had to discontinue

the use of it because the sand was round. It had none of the jagged exterior of the grog and did not give strength in the body as the jagged particles did.

Prof. Orton: There was not enough difference in my sands to give rise to anything of this sort in this connection.

The Chair: I do not know whether Dr. Zimmer has heard of the common notion—I will not say that it is a fact, for I haven't proved it—that dry ground flint has a round grain and pan-ground flint has angular grains. If the idea has any foundation, it would have the effect Mr. Gates speaks of.

Dr. Zimmer: The wet ground flint shows more coarse forms, while the dry ground flint shows rounder shapes.

H. B. Skeele: I will ask Prof. Orton what rules, if any, he established between the tensile strength of the unburned clay and the density and general strength of the general product?

Prof. Orton: I am not able to answer that question, Mr. Skeele. It is one which will require an enormous amount of work before any authoritative answer can be given.

The Graves Shale Brick Co., Birmingham, Ala.

The Graves Shale Brick Co. has excellent transportation facilities by switch to the Southern R. R. The grounds cover in all about 340 acres. The whole plant is enclosed in wooden buildings,

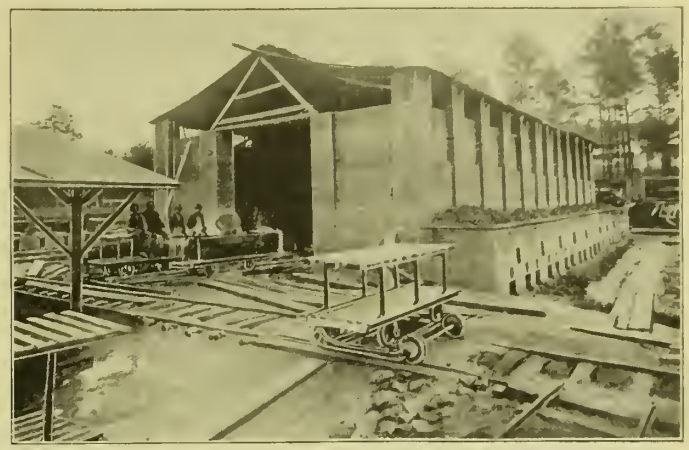
THE GRAVES SHALE PIT.

strongly and permanently built, 40 ft. x 100 ft., the shale house being 25 ft. x 50 ft. Shale alone is used, of which there is an inexhaustible supply. It is handled from an adjoining hill and mined to a depth of 50 ft. The shale is hauled to the plant on an incline track 200 ft. in length, by rope and friction pulleys, and side-dump cars. Here it is pugged, water only being added, in two horizontal pugmills made by Freese & Co. The plant is also equipped with two dry pans supplied by the American Clayworking Machinery Co., with 9-ft. iron frames. There is also in operation an Elder & Dunlap screen, there being an elevator and screen to each pan. The brick machine is of a very large size, and is made by A. M. Freese & Co., who also supplied the automatic cutting table. From the machine the brick are taken to the drier which is over 116 ft. in length, and has six tracks. The drier is strongly built of wood and brick and has a capacity of 60,000, being heated by steam. The bricks are dried in 24 hours.

One hundred and two double-deck iron cars of the Standard Dry Kiln Co's. make are used. Each car holds 606 bricks.

The plant has also three very large permanent kilns with a capacity of 500,000 each. They are erected with very heavy walls. The kilns are 30 x 80 ft. in dimensions; they are of the up-draft variety: the arches are lined with firebricks.

The usual methods of setting and tiering are employed. The company mines its own coal, the mine being immediately below the shale, one half-ton being used for every thousand brick. Watersmoking is accomplished by coke; 12 days are occupied in burning.

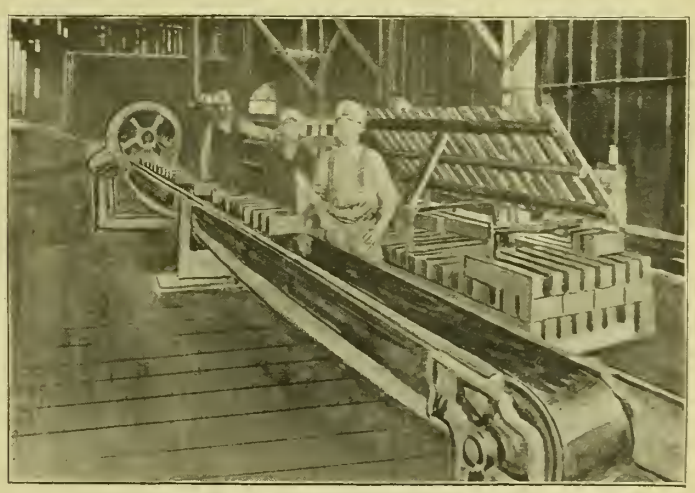


A VIEW OF THE KILNS.

The power equipment comprises an Eric City engine of 250 h. p. and three boilers, two of them 65-h. p. flue boilers made by Hardy & Tynes, of Birmingham, and a 90-h. p. tubular Erie boiler. The bricks are made from blue and brown shale, burning cherry red. The product of the plant is mostly building brick.

A recent addition to the plant has been an Eagle repress which is used for making outside finishing brick.

W. H. Graves is sole owner of the works. H. S. Matthews is general manager. Over 60 men are employed the year round. This



THE BRICKMAKING DEPARTMENT.

yard is very well planned and constructed, and there is not its equal in the South. Its capacity is about 75,000 per day, the market for bricks being excellent, and far in excess of the capacity to supply, as it is the only shale brick plant in the state. Over $50,000 was spent in the equipment of these excellent works.

Driftings from the Business Tide.

J. M. Clinger has finished burning a kiln of 110,000 brick at his plant at Dover, Ala.

James A. Virtue, formerly of Butte, Mont., projects opening a brickyard at Mekiste.

The Jones Brick Co., Knoxville, Tenn., will increase its capacity to 40,000 brick per day.

The Electrical Porcelain Co., of Pittsburg, Pa., will erect a factory at East Liverpool, O.

D. B. McWilliams, a brickmaker of Rossfarm, Pa., is in the market for new machinery.

W. L. Hill has purchased the equipment for a projected new brick plant at Sharon, S. C.

A brickyard with a capacity of 10,000 brick per day will be opened at Correctionville, Ia.

W. P. Pinckard, of Birmingham, Ala., proposes opening a firebrick plant in Tuscola County.

John Cooper, of Greenfield, Ind., is considering opening a brickyard at Wilkinson in the spring.

The Auburn (Pa.) Shale Brick Co. is running at its full capacity and turning 28,000 brick per day.

Detroit and Pontiac capitalists project the erection of a pressed brick factory at Franklin, Mich.

The Findlay (O.) Hydraulic Pressed Brick Co. will double the capacity of its plant on Consaul St.

Cooper & Smith, of Greenfield, Ind., have purchased a site in that city for a projected new brick works.

The Fiske Brick Co., Dover, N. H., has begun excavations for its proposed new plant at Dover Point.

The Nelsonville (O.) Brick Co. has been awarded a contract for furnishing 40,000 brick at $13.50 per M.

V. Sloggert and E. Pegden, of Fremont, Neb., have purchased and will operate the Continine brickyards.

The Latrobe (Pa.) Brick Co. will add several patent kilns to its plant, to meet the increasing demand for its brick.

The Waverly (Ia.) Brick & Tile Co. has furnished large quantities of brick for the erection of buildings in Dumont.

The Union Potteries Co., East Liverpool, O., contemplates several additions to its plant, and will install new machinery.

John A. Leonard has purchased Le Mars (Ia.) Brick & Tile Works, of which he has been manager for several years.

James Thomas, of Cedar Falls, Ia., has located extensive and valuable clay deposits at Dike, Ia., which he proposes to develop. Samples of brick made from the clay have been tested by experts with satisfactory results, and a brickmaking factory employing 40 hands may be erected at Dike.

The Charles Tippie Brick Co., Oklahoma City, Okla., proposes to enlarge its plant, and will instal new engines and boilers.

J. W. Johnson has purchased the Waycross (Ga.) Brick Co's. plant and is operating it with a greatly increased capacity.

Ernst Guher, De Noon, Wis., has resumed operations at his brick and tile yards and is making regular shipments of the product.

S. B. Donley, of Washington, Pa., has purchased 19 acres of land at Zediker's station as a site for a proposed new brickyard.

The Adams Brick Co., of Martinsville, Ind., is doubling the capacity of its large plant and will turn out 80,000 brick per day.

The Pomona Terra Cotta Works, of Greensboro, N. C., will be enlarged by an addition which will double their present capacity.

The Lehigh (Ia.) Clay Works, it is reported, will furnish 2,000,000 paving brick to be used in paving the streets of Fort Dodge.

The new brick and tile works which William Stuart and G. W. Umphrey are building at Armstrong, Ia., is nearing completion.

The Big Stone Brick Co., of Big Stone City, S. D., will furnish 300,000 brick to be used in the erection of a new court house at Ortonville.

The Bellaire (W. Va.) Brick Co. has completed extensive repairs on its plant and is building a new incline for hauling clay from the pit to the machines.

The Patton Brick Co., Cloverport, Ky., has manufactured and sold 4,000,000 brick this season, and is now at work on a contract to furnish 3,000,000 more.

John Rosenheimer, of Schlesingerville, Wis., has just completed burning a kiln of 600,000 brick. This makes a total of over a million bricks for him this season.

Frank Adams, proprietor of the folding chair factory, Bluffton, Ind., contemplates erecting a brick factory in that city, which will give employment to 25 operatives.

The Perth Amboy (N. J.) Terra Cotta Co. is furnishing large quantities of brick to be used in the erection of a new theater and office building at Wheeling, W. Va.

L. L. Stephenson, formerly of Elberton, Ga., is preparing to establish a brick plant at Birmingham, Ala., and has awarded contracts for machinery to the amount of $15,000.

A new plant will be erected at Brazil, Ind., with a capacity of 150,000 side-cut, sand-mold and firebrick per day. Chicago and Indianapolis capitalists are promoting the project.

The Mason City (Ia.) Clay Works is being extensively improved and new equipment is being installed. The company is building a smoke stack which will be 120 ft. high and 20 ft. square at the base.

The Anaconda Copper Mining Co. has purchased the property of the Armington (Mont.) Fireclay Co., which includes an ex-

tensive and modern plant and the best deposit of fireclay in the state. The new owners propose increasing the capacity of the plant and will employ a larger force.

Milton Taylor will shortly erect a pottery, for the manufacture of filters at Riverside addition, Toledo. The plant will be erected this spring. The outlook seems good for a pottery of this kind in that city.

The Stroebel Brick Co., of Central Lake, Mich., is preparing to remove its plant to Sault Ste. Marie, where a site has been secured for the projected factory which is estimated to cost $10,000.

The Brookfield (Mo.) Pressed Brick & Tile Manufacturing Co. recently burned three kilns of 100,000 brick each, and will use a portion of the product in the construction of an addition to its plant.

The National Tile & Roofing Co., of Lima, O., which recently incorporated with J. R. Sinclair as president, has begun the erection of its proposed large factory, which is estimated to cost $30,000.

Michael Shephard, proprietor of the West End Brick Works, Canonsburg, Pa., is rebuilding the portion of his plant which was recently burned, and plans to install new and modern machinery.

John H. Houck, representing the promoters of the newly organized McFarlain-Melanson Brick Co., which projects a large plant at Jennings, La., is preparing to purchase the necessary equipment of machinery.

W. A. Connelly, proprietor of the Soldier Fireclay & Shale Works, Portsmouth, O., has opened an office at Galin and Bond Sts., in that city. The Soldier Works is mining and shipping over 100 tons per day.

The Bloomington (Ill.) Pressed Brick Co. is making rapid progress in rebuilding its plant which was burned several months ago, and it is expected that operations in all departments will be resumed by December 15th.

The Seattle (Wash.) Brick Exchange during one week has shipped 600,000 brick to be used by the Great Northern Ry. in improvements at Everett, and in building the Everett Electric Co's. proposed new power house.

Messrs. Griese have purchased an 80-acre tract of land at Newburg, O., and begun the erection of a brick plant which is estimated to cost $250,000. Both paving and sewer brick will be manufactured at the new works.

Samuel H. Weimer, of Boston, Pa., has secured an option on a 20-acre site at Port-Vue for a brick plant which will employ several hundred men. Common and firebrick, patent cement and flagstones will be manufactured.

The National Abrasive Manufacturing Co. will install a plant at Waynesville, N. C., for mining corundum and kaolin on Scott's Creek. The plant is expected to cost $75,000. Col. S. A. Jones, of Waynesville, may be addressed

Rapid progress is being made in the erection of D. F. Stauffer's new brick plant at York City, Pa., and it is expected that operations will be begun early in January. Press brick will be turned out at this plant by a new process.

The Rose Brick Co., of Roseton, N. Y., will erect new kiln sheds, which when completed will cover a greater area than those of any other brickyards in that part of New York. Large consignments are shipped regularly from the Rose company's yards.

J. R. Van Buren, of Macon, Ga., expects to secure a contract from the builders of the New York tunnel to furnish several million white brick to be used in the construction of the tunnel walls. The brick will be manufactured from the clay mined in the vicinity of Griswoldville, in Jones County.

The Milwaukee Brick Co., Milwaukee, Wis., has purchased 30 acres of blue clay for the sum of $4,000. It is at present putting in a side track, and ships the clay to Milwaukee where it will be manufactured into bricks. The clay is considered superior to any other in the state for the manufacture of a fine cream-color brick.

Nelson & Dawson's new brick plant at Rolfe, Ia., is practically completed and will soon be put in operation. The equipment comprises a 50-h. p. boiler, a 40-h. p. engine, crusher, mixer, automatic tile cutter, and a brick and tile machine with a daily capacity of 10,000 four-inch tile, and 35,000 brick. Four kilns are in course of erection.

Dr. J. J. O'Brien, of Santa Clara, Cal., has made the discovery of extensive beds of terra cotta while boring an artesian well on his lemon ranches at Corpus Cristi, Tex. He considers the quality of this clay superior to any in California, as it contains a large proportion of silica, and is preparing to erect a plant for the manufacture of brick.

The National Tile Roofing Co., Lima, O., which was recently incorporated with J. R. Sinclair, president, has purchased a 40-acre site in that city and will soon erect a factory at an estimated cost of $30,000. A vein of clay 10 ft. in depth has been opened, and the output of the plant will probably exceed 10,000 tile shingles per day. The plant will give employment to 60 men.

The United States Pressed Brick & Tile Co., of Oklahoma City, Okla., which was recently incorporated with I. N. Phillips, president, is preparing to erect its plant at once, and will be in the market for a complete equipment of brick and tile-making machinery. Two dry presses will be installed with a capacity of 25,000 brick per day each. A 60-h. p. engine and 80-h. p. boiler will be installed.

J. M. Powell, of Orestes, Ind., is at the head of a company which projects a large drain tile factory at Vermilion Heights, Ill., on a site adjacent to the Western Brick Co's. plant. Danville (Ill.) capitalists are interested with Mr. Powell in promoting the drain tile works, and it is proposed to expend $50,000 in the erection and equipment of the plant. The building will be a three-story structure, 200 ft. long, and will cover an area of 12 acres.

The Indiana Brick Co., of Anderson, Ind., has purchased 200 acres of land in that city at the junction of the Big Four, the Pennsylvania and the Chicago & Southeastern railroads, and has begun work on the erection of one of the largest brick manufactories in the West. The plant will have a capacity of 100,000 brick per day. The company has purchased a 24-track steam drier of the Standard Dry Kiln Co., and other equipment of the Atlas Engine Works.

French Brick and Tile Making.

BY ARGIL.

As compared with other countries, the brick and tile industry in France is very much behind. The principal causes for this are that stone is both very plentiful and cheap and is of a durable quality, The next reason is that the demand for ceramic products of a fair or high order has not been of a nature to warrant the outlay for a modern plant with superior outputs. In the vast majority of cases bricks and tiles are hand-made; the clay is somewhat primitively prepared, and the brick burned in clamps. Stone is nearly always employed for architectural work; only some inside walls may be built in brick. There are many mansions in red brick and stone scattered here and there over the country, and a few centuries old, that have stood the effects of time well. There is no reason why a well-made brick ought not to be as durable as stone. Unfortunately, we have not many recorded tests as regards the relative strength of the two materials, while evidence is conclusive that both can be sound and satisfactory. The employment of bricks for railway bridges attests the value of their strength.

In France, in districts where stone was scarce and dear. brick was the material employed for building. Houses built in bricks are very common in Toulouse; the Cathedral of Alby and several churches are constructed with brick. In Languedoc the moldings of edifices were cut in tender and homogeneous bricks. Most structures during the eighteenth century in Touraine, Blois Castle, the Louis XIIth wing, Tours, Fontainebleau, and St. Germain-en-Laye, had brick as the chief building material. During the epoch of Louis XIII. bricks were very generally employed, and were largely used in combination with stone in the erection of houses, mansions and palaces. The houses in the Place Royale and Place Dauphine in Paris present a happy association of brick and stone work. After the Renaissance brick was held very much in honor, but during the reign of Louis XIII. the fashion also declined. Indeed, during the second half of the seventeenth and eighteenth centuries brick work may be said to have been abandoned; since then, however, in our days, whole towns are built entirely of brick in France, and among modern edifices so constructed may be cited in Paris the barracks in the Rue de Banque, the Central Markets, and the College Chaptal, where iron is the joint material worked up. The use of machinery for brick and tile making is not extensively employed in this country; there is a relatively smaller demand for the products, which explains why the manufacture of bricks, &c., largely remains as it were, the apanage of the hand-making industry. The machine-made brick secures greater density and compactness and admits of a variety of forms and methods of making. Machines can work the clay in a dry or semi-dry state; clay in the wet or plastic condition is easier to manipulate, but when the dry clay is forced into the molds the operation is shorter and the drying quicker. However, whether the molding be by machine or hand, it consists of the usual four common operations, viz:—preparing the clay, molding, drying and burning. The selection and working up of the clay exact experienced attention. It must neither be too fat nor too lean a clay. If the former, it will in burning produce bricks with fissures, deformations, and prove difficult to work; if too lean, the bricks will stick together, become faulty, and malformed by fusion. Soil largely mixed with vegetable matter, or where clay is markedly absent, cannot make bricks of the highest quality. Lime is not a desirable constituent of a brick soil, nor metallic substances, as pyrites. These when present in too large quantities, form a kind of flux, while burning, with resultant cavities or air holes, in the interior of the bricks, and external cracks or fissures. In proper proportion, however, the fluxing tends to aid the requisite degree of vitrification desired. The flux gives a kind of glossiness to the brick—on the surface at least, and which aids its damp, or wet-resisting power.

All hard, foreign bodies should be taken out of the brick clay. Following as the bricks are to be made by hand or machinery, the clay will be placed in a reservoir in autumn, left exposed to the ameliorating influences of the winter, and be occasionally turned over with the spade to secure the best plastic condition.

Before embarking in the employment of an untried, or unknown clay, serious brickmakers at first conduct a series of test experiments, when superior products form the end aimed at. They burn their experimental green bricks in the ordinary kiln. Before commencing, they bring the clay up to the plastic ideal they desire; if too fat, sand, ashes, &c., will be added; if too lean, the alumina will be increased. The clay to be molded can be prepared by the pugmill, and mixing machines, worked by manual, horse or other motive power.

The molding of the brick is performed either by hand or machine. In France, the former is the general plan; the latter is adopted where brick is the principal material to be employed for constructions. France has much good building stone—like the Scotch—but it is less utilized. The ordinary made bricks are so cheap—the Bourgognes, 66 francs, or $13.20 per 1,000, delivered in the capital—that they are preferred for temporary constructions; the outside walls being plastered, and kept whitewashed. Other varieties of brick cost 110 francs, or $22, per 1,000. For hand-made bricks the operations are simple; the clay being mixed in the reservoir or pit, is brought in a barrow, or served directly from the pit, in required quantities upon the molder's table. If a machine, the operator will receive it. pass it on the molding plates, to be wire-cut as desired. The mold, in wood, brass or metal, is slightly larger than the intended brick; this allows for shrinkage in the drying and burning; the molder fills it with the wet clay, and by means of a lathe, or knife, scrapes off all superfluous clay; he turns the shape out upon his sanded table, a lad carries off the bricks in a hack barrow to the drying ground close by, and ranges them in slight rows, on sanded ground, with a covering of straw, or rushes, to ward off rain, until they acquire a preliminary consistency; later, they will be packed, as open work walls, more thickly. Of course, machines have facilities and combinations for economizing operations. They can mold several bricks at once, and some of several of the operations as well serve themselves automatically with the plastic clay, pressing out the water, so that the green bricks are stiff, so as to be at once ready for the kiln. Other machines do not employ wet clay, but utilize that in its natural state, when the machine compresses the clay into the desired shapes.

The next operation is the burning. The green bricks, sufficiently hardened in the open air, are then examined; they are beaten with a lath, then a knife pares off any clinging clay, or rough edges. Next, they are placed in the kiln or clamps. The burning operation is the test of brick manipulation. For the clamp, the bricks are piled in parallel rows, intermingled with fuel, either turf, petroleum, wood or coal. The clamp is covered outside with some plastic clay. When burnt and cooled—a matter of 2 to 4 weeks—the plaster coating is broken through, and the bricks withdrawn. A clamp may contain 50,000 to 200,000 bricks. This is the ancient, and still largely patronized method, known as the Flemish plan, because general, both in Flanders and the North of France. At least 10 per cent of waste is to be counted upon, consisting of over-burned, broken or defective bricks. One-quarter of a ton of small coal is allowed per 1,000 bricks and the expense is estimated at 12 fr., $2.40, for that num-

ber. In the kiln the burning is effected with more regularity than in the Flemish plan; there will be less waste on the output, a greater saving of combustible, and so economy of heat.

To heat equally all bricks is the aim of burning; but that is not attained either in clamps or in kilns—unequal burning as a rule results. The best bricks are derived from the central part of the mass, where the heat plays more uniformly. Those taken from the top or sides are of the poorer quality, and are only employed by the trade for inside, not outside work. Some of the top bricks may be well vitrified and hard, and of capable resisting surface; but they are too brittle to bear weight, or sustain pressure; nor does the mortar take kindly to their glassy surface. Hoffman's method of burning bricks is being slowly adopted of late; indeed, the plans of kilns are quite numerous, and have for end, to economize the heat, and save labor. Hence, the importance attached to utilizing the arrangement for the down draft of heat. The kilns are fired with wood, turf or small coal, according to localities; they are constructed in refractory or fireproof brick; the green bricks are ranged, as in the clamp, in parallel rows, so that the heat can circulate from the center through the whole open-worked mass. The maximum effect of heat is known when the empty space left by the burning is reduced to one-third of the total volume of the mass. French makers class the outputs into five categories: First quality, 40 per cent; second, 15; third, 25, and fourth, 10; the fifth being waste or refuse, but which can, however, be ground up like the refuse material of stone quarries, and with clay worked up in the pugmill and mixing machine for good fire bricks. Bricks are either full or hollow, the latter being made by machinery.

The full bricks employed in Paris, and known as Bourgogne, are divided into three categories, and are made in three different qualities, namely, red, grey and brown. The bricks appertaining to the first category measure 0 mm .22 x 0 mm .11 x 0 mm .54 centimetres (8 2-3 x 4 1-3 x 2 1-6 inches), the first being the multiples of the other two. In the second category, the bricks are fabricated in imitation of the Bourgoyne, in six qualities, and called Vaugiard, Pantin, Passy, etc., followinig the localities in Paris where they are perpared. They measure 0 mm .22 x 0 mm .11, and 0 mm .06 and 0 mm .07. The third class are a rough quality; their dimensions are 0 mm .24 x 0 mm .10 x 0 mm .058. An ordinary brick weighs 4 lbs., it may be able to support a pressure of 73 to 336 lbs. per square centimetre. A London brick weighs over 6½ lbs., its size is 0 x 4½ x 3 inches.

The color, tone or tint of a brick is no mean test of its value or building qualities. The best red brick is bright, pure and clear in color, and when struck with the trowel will emit a clear metallic ring; it will resist weather influences of rain and damp. However, there are many excellent bricks that do not possess the clear, red color. Blue and yellow bricks are not so general, or as various as red; the blue especially. Favorite shades are white, cream, buff and ivory. Provided the maker can produce a brick straight, sound and with a moderate gloss, he does not care much about color. Forty to fifty hours burning is sufficient time for baking red and white bricks; some fire bricks will require 150 hours. The presence of iron imparts color; if the clay contains less than 1 or 1½ per cent, it changes in the kiln to a cream. or buff tint; if more than 2 per cent, the color trends to yellowish fawn and dark red. Blue bricks may in some degree acquire their shade by regulating the air during firing. The presence of lime changes the red color produced by the iron into a cream tint; magnesia arrests its development.

Fire bricks are made for furnaces, where long and continued heat is required. They can resist any temperature. Paving bricks are distinguished from ordinary ones by being thinner, though of the same length and width, generally not more than 1½ inch thick. Paving bricks are burned very hard, vitrified, so as to resist wear and tear; their tone is generally blue. They are not much employed in France, save for court-yards and sidewalks. They have to compete with asphaltum. For out offices brick paving is more extensively used. Sir Frederick Abel affirms that the valuable properties of firebrick are due to the combination of two principal constituents, silica and alumina, where silica forms two-thirds of the whole. The Dinas firebrick has a much larger percentage of silica. A standard brick should be homogeneous, regular in shape, have parallel surfaces, plane faces, sharp edges, hardness and angles; be of uniform texture, fine grain, and have a clear ring when struck with a hammer.

Tile-making does not command so great importance as bricks in France, although the demand for roofing and sanitary tiles is relatively large, that for paving is moderate; while drainage pipes are of various models for different ends. Machinery is largely employed in their preparation. Much more careful attention is paid to the preparation of the clay. The filling of the reservoir is begun in autumn, when clay in a minute state of division is employed for the purpose. The mass is to be made up of layers kept under water to mellow, two inches thick at a time, while being exposed to the wintry weather. The pug-mill gives the clay a first crushing, taking out carefully any stones, &c.; a second crushing follows, when the clay is fit for molding, either by hand or machinery. The operator imparts the form or shape required with his hands, then it is duly pressed on to a convex surface to dry, acquire some consistency, placed in a frame to correct any irregularities in shape, and to trim off all surplus of clay. When sufficiently hardened by drying in the air the tiles are conveyed to the kiln, placed endways therein and burned. For drain pipes the plastic clay is lapped round a drum of a required pattern and the pipes cut off to any length desired after the joining of the side edges. There is, hence, no very great differences between ordinary tile and brick making. Some attempts are being made to employ ornamental or encaustic tile work in the erection of dwelling houses; it looks too gaudy and Oriental and does not "catch on." Even terra cotta has few admirers as a building material; it may be said to be unknown; it is meeting with marked encouragement in London. It has a warm look, is clean, smart, and can be easily kept so. It is dry, resisting and durable. It is warm looking in winter and cool in summer.

Sea Legs Wanted.

The "brickies" of Haverstraw, N. Y., were very reluctant to put out from Blanket Bay the other Sunday morning. The wind howled down the Haverstraw road at a 50-mile gait, that made the yard-boys forget to whistle and walking difficult.

The schooner, Thomas R. Williams, lay at the yards of her owners, Allison & Wood, loaded with a select cargo of hard brick for Iona Island, and the Emily R. Baxter waited to be loaded at the lower Goldrick yard. The wind cared not a snap for either of them but bumped and hammered them both against the dock. The T. R. Williams, skippered by Frank Clancy, a man proficient in brick navigation lore, put out to sea, tacked, wore ship and club-hauled and sank ingloriously. The Emily R. Baxter was hauled to the lower end of the shed and went down head-on, in the very spot where so many brick schooners have found a resting-place.

At the brickyards sea legs were wanted to conduct the firing operations with any degree of success. On the Malley yard the waves broke over the dock and against the hot kiln, raising such a cloud of steam that the fire department was called out to quell the supposed fire in the new shed. In the Goldrick yard, the heavy seas broke through the woodpile that separated the kilns from the water and the burners had to erect a breakwater of brick banked up with molding sand in order to keep the water from putting out the fires in the arches. Since Sunday the burners have taken to hitching up their slacks, spitting over their left arm, and the use of a guttural "Shiver my timbers."

The Setting and Burning of Hollow Blocks.

The Right Man Needed — Burning in General — The Best Method to Set a Kiln with Hollow Products — The Starting of the Fires — On Light Firing — A Chat on Watersmoking — Cleaning the Fires — How to Saltglaze the Goods — Cooling Off.

BY H. FUETTERER.

In carrying on any business or trade there is always some part which is of more than ordinary importance, and on the faithful performance of which depends the ultimate success of the whole. In the clay industry this part is the burning. This, however, does not say that we should look down on the rest of the labor in the business, and the burner should not consider himself the "autocrat of the yard." If by accident or neglect in any stage during the

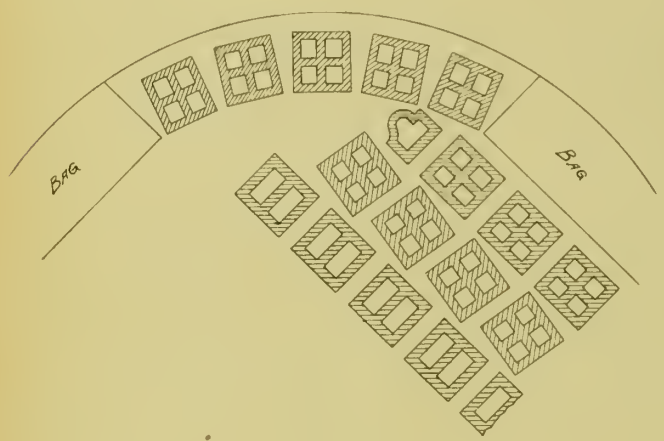


FIG. 1.

making or drying of the ware, there should be any mishap, the raw material can be worked over, and the loss sustained at least partly recovered; not so when spoiled in the burning, here it is all spoiled, all a loss, and with the additional expense for fuel, time and labor. And if bad burning is done on the "continuous plan" the kiln will soon become the grave of what otherwise might have been a prosperous and live institution. A man employed in a position of such vast importance and where so much capital is at stake, should be selected with care. He should have the entire confidence of his superiors in the kiln matters. He must be by all means strictly sober, he must be well versed in the building of kilns, and the principles of combustion. He must be able to turn out the highest possible percentage of No. 1 ware with the least fuel and time possible. There is hardly any occupation where we come more in contact with the laws of nature than in the burning of clay wares, and the laws of nature do not permit of its being forced. Therefore, to attain results the burning must be brought down to a system and receive all the care and watchfulness that can be given. The burning of to-day is no longer admitted to be a matter of good luck or bad luck, but is required to be a matter of business, just as much as the making up of the pay roll. It must be correct, and the fellow that burns on the hit or miss plan is no longer in it.

The burner must also give due credit to his assistants, and not keep from them too many so-called secrets, for his own success depends to a large degree on their faithfulness.

We wil now proceed to businesss. The ware should be bone dry before set in the kiln. The kiln should never be called upon to perform the duties of the dry house. The imaginary gain from setting green ware "to help us out" is heavily overbalanced by the additional loss in time and fuel. If the kiln turns out all right, of course, some burners will tell you they they can burn anything, but in nearly all cases they are able to burn nothing.

In commencing to set, fill in between the bags first, and then across the kiln as shown in Fig. 1; on the bottom is a 1½-in. ring; this ring should be laid to a level. The standard blocks 8¼x8¼x16 are set five feet high; higher setting is impractical. They are set square over each other and alternately square, and angling across the kiln, Fig. 1. This will give two clean faces to every block. Blocks so shaped that they cannot very well be set on end are set as in Fig. 2, with thin layers of sand between them to insure level setting and to keep the ware from sticking. This will give a good clear face, which otherwise would be sooted and discolored. In setting this way, especially if one has unusually long shapes, care must be taken that the blocks are laying solid on each other. If there is any strain they will break or get out of shape.

After closing, the fires are started, and care must be taken not to get them too big or the ware will shoot. It is a good idea not to close the crown for about 12 hours; by that time the heat will be more equally distributed through the kiln. By leaving off the crown, part of the moisture driven off during watersmoking will have a chance to pass off through the crown; otherwise with a closed crown the same is forced down through the blocks in the lower part of the kiln, and as the time has been too short to heat them, they are cold enough to chill and consequently condense the moisture, and in connection with the gases from the fuel and salts in the clay, will settle on the ware in the form of a scum, known as whitewash. This is especially true when watersmoking is forced too rapidly for the ware set green. I always found it good practice, if I was compelled to set green ware, to light only half the fires, and give the kiln full draft to carry off the moisture quickly.

For convenience I divided the burning into different stages, or

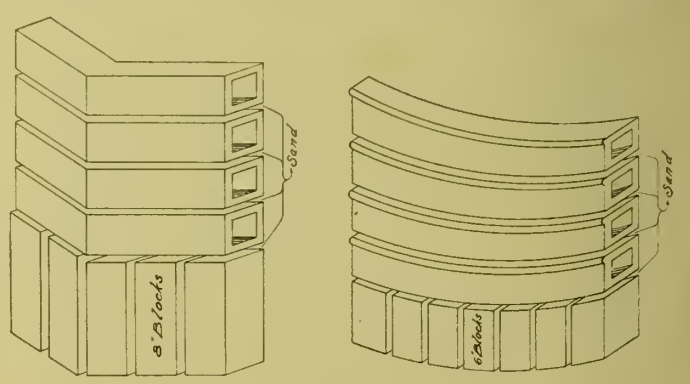


FIG. 2.

in other words established a scale, i. e., 1, watersmoking; 2, half fire; 3, three-quarters fire; 4, full fire.

The first is a light fire and the fuel will not reach higher than the bearing bars, Fig. 3. Half fire is a thin layer of fuel half way up the grates, Fig. 5; and full fire is the mouth of the furnace closed up, Fig. 6. This applies to kilns with slanting grates, but can easily be adapted to any other kind of furnace. This method I found best

to bring firing down to a system. There is one more point I will dwell on before I proceed, namely, the cleaning of the furnaces. Insignificant as it seems, it is of great importance, and a clean furnace will lessen the time of burning several hours and consequently the fuel bill in proportion. The burner should always see to it that the flues are cleaned out periodically, and a memorandum should be kept. He should not be afraid to do the inspection in person. It is not a very nice job to go underneath, but it is very often a paying trip and some times clears up "kiln mysteries" in short order. He should also make use of a kiln record to cover the entire time of burning from start to finish, and also the cooling. This will avoid many mistakes. It is a very risky proceeding to keep track of a number of kilns in one's head. Yes, it is impossible, and then it is not business, and all well conducted clay plants have in use some form of record.

It is often the case that the burner goes to his fireman and says, "Jack, when was No. 5 set?" and Jack will say, "Let me see; I believe Monday, I ain't sure." How was she, pretty dry?" "Pretty dry, I guess," Jack will say. "What is in her?" "I guess a little of everything," Jack will say. Now this burner is not up to date, and not in it with a man who by a glance at his kiln record can tell when the kiln was set, if green or dry, and what size and kind of ware it contains.

The kiln is set, the test pieces are put in place. The top ones on the third block from bottom and three blocks in from the door; the bottom test pieces are put three blocks in from the door and about six inches from the bottom, Figs. 7 and 8. There are eight test pieces, four at the top and four at the bottom.

The doors are now closed and plastered, and the damper is pulled out. We suppose that the ware was set dry. The fire should be very light to start with and should be built under the bearing bars. As soon as they are burning well, we place the grates, say in about two hours. Some may see danger in this and the majority of burners hold the kiln on a slow fire for 24 to 30 hours; but we do not make heat with the grates, but with the fuel, and it is easier to keep a regular and even fire with the bars in. I never could see any advantage in holding the kiln on a little black fire and then increasing the fire at a rapid

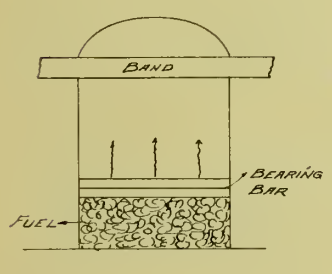


FIG. 3.

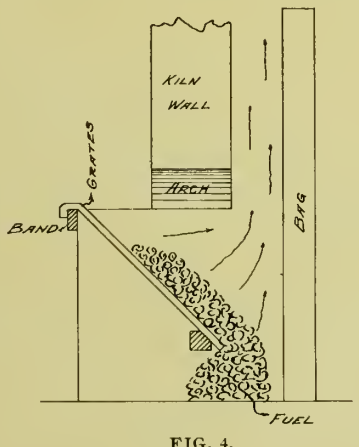


FIG. 4.

rate, as is often the case, the most important part of the burning being done unsatisfactorily, namely, the expulsion of the water-gases. We will go back to the start, to the stage of the burning called watersmoking, or driving off the mechanical moisture, or in other words the water imparted to the clay during the pugging and not completely expelled in drying. I think there is altogether too much importance given to this watersmoking. True enough, there is danger of shooting, but this can be done on the first fire, no matter how dry the ware was set. I have never had anyone explain to me satisfactorily the real cause of shooting. If it, however, occurs, the crown plate must be taken off, and the fires slowed down, until shooting ceases. For the next 12 hours fire every 1½ hours. Do not cast the fuel back against the bag, but slip a half shovel down the grates, in a manner so that the weight of the fuel will itself settle the fire, as shown in Fig. 4; in the next 12 hours we bring the kiln up to three-quarters fire, Fig. 5. We have now arrived at the very critical stage of the burning. There are two kinds of water to be expelled; first, the moisture mechanically mixed with the

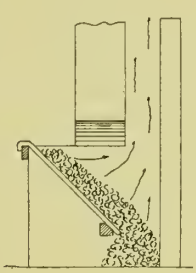


FIG. 5.

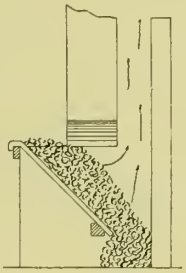


FIG. 6.

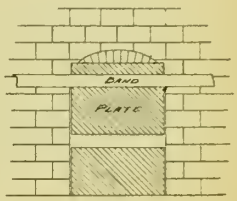


FIG. 9.

clay, and second the combined water or that water which is naturally in the clay and combined with it by chemical bond. The first moisture is driven off during watersmoking and the combined water not until the ware in the kiln turns to a red heat. Up to this point the clay has retained all its natural properties, but now the combined water becomes steam, and passes off as watergases. At this point the clay loses forever its plastic nature.

As we all know there are in most clays, in some form, their natural depositories, impurities of all kinds, mostly carbon. Those impurities will burn and form a gas, this gas has to be worked out of the clay during the time the clay is at red heat. The temperature of the kiln must be held so that the pores through the surface of the ware are kept open and allowed the gases to pass out. If heat is increased too fast there will form on the surface of the ware a thin vitrified coat that will, even if no thicker than tissue paper, confine those gases, and when annealing takes place they will escape and form a blister. This is by some burners attributed to all sorts of reasons, but is nothing but imperfect workmanship on the part of the burner. This all takes place during the three-quarter fire. We will, therefore, hold our kiln for about 18 hours, but it would be unwise to go from a three-quarter fire to a full fire at once. We still must only increase the fire steadily to maintain the stability of the ware and avoid rush fires, and such defects as twisting out of shape, leaning and fire cracking. Twelve hours should be required at least, to bring the three-quarter fire to a full fire.

We have now arrived at where we must clean fires for the first time. How will we do it? Shovel the ashes out of all furnaces, pull out everything with clinker bar and hook, and fill up with coal again. That is the way some will do it, but it is altogether wrong. We should clinker one in 12 hours, and here is the way to do it. At any convenient time, say after dinner (the fires then will be clean for the night shift and will not have to be disturbed or irritated again until after midnight), fire up all around, then shovel out the ashes of one furnace, nothing except ashes, not live coals, then loosen the clinkers with the bar and work them down to the bottom of the grates and pull them out with the hook. It is the common practice to pull out almost everything, but this is only hard work and injurious to the ware, for it will only empty the furnace of most of the live fire and admit a rush of cold air. The back of the furnace will turn dark and it will spoil the ware. It will also necessitate the filling in of too much green coal, and this in turn will require hours before the fire can get back to its original con-

dition, not speaking of the necessary loss of fuel. We do not take the next furnace until the fire in the one just cleaned is back to its natural state; then we proceed with the next one, and so until finished. In this manner we are able to avoid any rush of heat, for naturally after cleaning the fires burn so much more rapidly and must be kept under control with extra care. We will go ahead now.

The kiln is at full heat. The firing must be done regularly, not too heavy, but often, so that we will always have a clear heat in the kiln. Give about one inch of opening over the top of the fuel. This will prevent the top of the kiln or rather of the ware overburning. Do not fire on the give-her-hell plan; if you do, part of your employer's money will roll out at the top of the stack in big black clouds of smoke, and part will be taken over to the dump, when the kiln is drawn, and whatever ware has any worth at all will be rough with iron and have an ugly appearance.

The ability of a burner can be pretty well measured by the stack. An able burner will get combustion in the furnace and but little unburnt fuel gases will escape through the stack. After the kiln has run on full fire for 12 hours it will be well to put a trial on

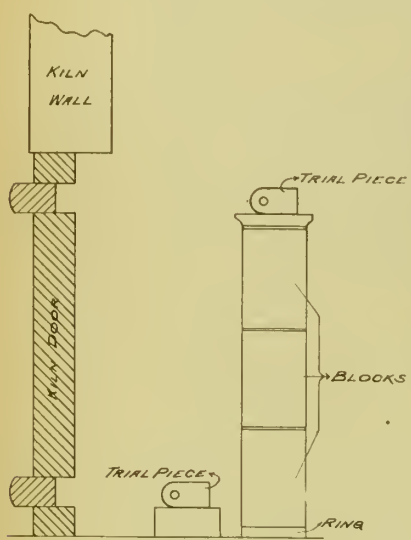


FIG. 7.

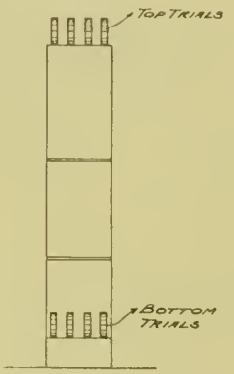


FIG. 8.

top. If this should be fairly annealed, lower the damper a point, to retain a good live draft. This will in from six to eight hours bring the heat down to the bottom of the kiln and finish the burning. Care must be taken not to have the damper too low and the fire checked down or the wares will be roasted.

If the ware is to be salt glazed the fires should be cleaned lightly, but well, about one hour before salting. This will give all the fires time to get in good condition. The furnace should not be be too devoid of coal, nor too full of green fuel, but the whole fire should be in an incandescent state to produce quick evaporation. The salt should be drawn in, a small shovel full in each furnace and scattered. If thrown in one place it will deaden the fires and evaporate too slowly. As soon as the salt gases work off to a slight vapor give a second round; care should be taken, however, that the fires do not get down too low to have them in a good condition. We should be able to close them with two light shovels full of coal on top of the salt. After two rounds of salt are given it is advisable to pull a trial. If the glaze does not take well an extra fire between salting will be of benefit.

I often use a bucket of water in the salt. This will produce to some extent hydrocarbon gases, and in making a more intense heat will help quicken the evaporation of the salt, and at the same time prevent the ware from getting rough. After three rounds have another look at the trials. Three rounds of salt are generally sufficient, if not a fourth round must be given. "She's got enough," the burner will say.

We have now arrived at the second state, the cooling. This is of no less importance than the burning, and the excellent products of days and nights of worry during burning can be brought to naught by imperfect cooling.

Cooling is as essential to the making of sound perfect ware as good burning. Here is the way to do it: About half an hour after the last round of salt give a light fire and pull the damper nearly out, giving the kiln full draft. In about four hours more, or as soon as the furnaces turn a dark cherry red, pull the grates, shovel out the ashes and close the furnaces with plates (old boiler plates will answer very nicely), Fig. 9.

The kiln may now stand this way for six hours without injury to the ware. After that time plaster up tight with clay mortar on the sides of the jambs, and leave the small openings on top and bottom of the plate open. Leave the kiln in this condition until cool enough, so that the bare hand may be held inside the top trial hole. The door may now be taken down gradually and the crown plate removed. This is one way of cooling. A good many burners are opposed to cooling through the stack and would rather cool with the back draft, but I never could see why, only it is somewhat faster. It always looked wrong to me, because at the time of finishing a down draft kiln the highest heat is always in the top of the kiln, and by cooling back draft we trap the damper and of course rush all the heat in the kiln to the top, where it is not needed, while in cooling through the stack we pull the extreme heat from the top for hours through the ware to the bottom and by so doing greatly help the annealing of the goods in the kiln. The improvement in the soundness and clearnesss of the burned ware is very marked and will greatly make up for the short delay in time from the other way.

In about eight hours after salting close the damper and open the crown one-third. In twelve hours more take down the doors about two square feet and four or five bricks every three or four hours until door is half taken down, and whenever the bare hand can be held in the crown hole uncover the kiln and let cool for drawing. By following these instructions perfect ware will be produced, in shape and color—two very important features for hollow building blocks.

Another Fish Story.

Our English contemporary, "The Pottery Gazette," is responsible for this anecdote. We wash our hands from any stains of its origination. We simply have not the courage to father it or even foster-mother it. As an excellent joke, however, it is too good to be lost:

An amusing crror was perpetrated some few years ago by a famous London firm of china and glass merchants. My wife's cousin was paying us a visit in town one season, and he asked me to tell him where he could buy a set of handsome decanters for his father, one of the justices of the Supreme Court at Washington, for a birthday present, as the old gentleman was particularly partial to English cut glass. I took him to the great firm in question, where he chose what he wanted, and gave orders where the package should be sent to him, adding, "Be sure you put on it C. O. D." This is the common American expression for cash on delivery, meaning that the bill should be sent up to the house with the parcel for payment. When the case arrived, he did not unpack it, but forwarded it on to Washington, where it turned up safely with "C. O. D." exquisitely engraved as a monogram on each of the decanters! It afforded my uncle, however, a hearty laugh, and gave him a little anecdote to tell when passing round the wine at his official dinners.

How Clay Was Found Three and a Half Miles Under the Ocean.

Will the time ever come when the fast-multiplying millions of human beings shall cover the face of Mother Earth so thickly with brick buildings that clay deposits will fail to meet the demand for material for structures, streets, etc.? In many places this plastic bounty of nature is represented only by holes, out of which wealth has come, but into which it cannot be put back. Each year sees about seventy-five million dollars worth of clay products come from the factories of such industries in the United States, and each year leaves a corresponding vacancy in clay banks—a large run on the banks—if a pun may be perpetrated. And if the distant future—

When we've all gone to bed,
With a covering of clay or dirt
Above each tired head—

finds man looking in vain for clay in lowland or on the hills, with no refuge but holes, where could he turn for more clay? Now this seems a foolish question—and perhaps it is—but "there are more things under heavens than are dreamt of in your philosophy, Horatio."

And one of these "things" is clay. And the "philosophy" of the matter lies in the fact that many rivers, lakes, streamlets and ponds. "though often disappointing on surface are good at bottom" —good clay, and costly clay, too, to get. The clay producer of the far-away future (is it many centuries, if we consider the building industry of the one just closed?) when his working material becomes so very scarce, must become, in part, a waterman—and, perhaps, a seaman—laboring on his "full-rigged" dredge-boat and flying his admiral's flag on a mud scow.

And just see what a revolution in affairs—national affairs, at that—this will cause. It will cut down the river and harbor appropriations, put the be-diamonded lobbyist out of a job and make less talk and jobbery in Congress. It will also open to commerce many streams now navigable only for catfish and eels, but which sometimes come in for more or less large slices of pie, cooked in committee rooms, carved in the Cave of the Winds and passed over the Treasury counter.

I said that the coming worker in clay might become a seaman—and he will sure enough, if he must sail the raging main in search of plastic material. And it can be gotten there, but by a process almost as costly as that employed in searching for treasure in the silent depths of the voiceless mere. Millions and millions of tons of clay lie beneath the mighty "waste of waters" in their profound depths, and in shallower neighborhoods, where the sea sings a siren song to the unwary.

I have not been down and interviewed Neptune in his cave to find out this news—and no clay man need think he can employ me to dig clay down there—but Uncle Sam, of America, got the "news" by wire from "below seas," and I got it from a man whom the old gentleman employs in his fish business—but it isn't a "fish story." Uncle Sam seems to be constantly trying to find out about everything under the sun—and in the sun, too; and the manner in which he does some things, prying into nature's secrets, etc., is most interesting and instructive.

The fish business of our famous Uncle is not connected with his clay business, which properly belongs to the department of geology. But there is one branch of the former industry which also embraces several other important features connected more or less closely with the work. And this has to do mainly with the deep sea, its depth, bottom, fish and other things, that can only be investigated by the use of a big steamship and costly apparatus made especially for the purpose.

The U. S. Fish Commission ship Albatross is the principal deep sea-craft employed in this work. She is a twin-screw, brigantine-rigged vessel, 234 ft. long, and is splendidly equipped as a sea-going ship, and for scientific research. There are on her laboratories with their tables, tanks, jars, instruments, etc., for investigating what is drawn up from the black depths of ocean; chart room, state rooms, ward room and other arrangements for work and comfort. The mechanical equipment includes an electric plant for light in all parts of the ship—and sometimes used in making collections near the surface of the sea—and a sounding machine, the latter being the medium through which came the "news" mentioned above.

That this news came by "wire" is seen in the fact that wire (piano wire) is used for a sounding line. To this is attached a sounding-rod, made of metal, hollow and having sharp edges at bottom, where is located a valve. The rod has also a heavy sliding, iron ball weight (weighing about 50 lbs.) through which it extends; and being further equipped with thermometer and water-specimen cup, is ready for the plunge. Usually about seven miles of wire lie coiled around a reel on the ship's deck ready to follow, over wheels and pulleys, the investigating rod.

When the signal for lowering is given, wheels begin to revolve and the sounding cylinder with its staff of mechanical newsgatherers sinks down, down into darkness and cold until bottom is reached. When this occurs the sharp edges of the metal rod plunge into the ocean's floor, the heavy ball slides downward, and the valve closes, securing the material forced into the cylinder. The knowledge that all this has taken place is found simply in the slacking of the wire and relief of tension on the apparatus on shipboard. Now hoisting begins, and soon the nature of the bottom below is learned—whether the land is good for a brickyard, an eel farm, a sponge farm or what—usually "what."

And that is how the news came from the Kingdom of Neptune. And you see, it came by wire. The story, as further set forth by Uncle Sam's servant, is connected with a most interesting cruise of our good ship Albatross, which was made in the southern Pacific Ocean for the purpose of making soundings of, and collections from, the sea and also collections in the fields of ethnology, geology, zoology and botany, from a number of islands.

It is a well-known fact that there are some very deep "holes" in the sea; some of them are more than five miles from surface to bottom, being often the craters of extinct volcanoes (they ought to be "extinct," with so much dampness over them), and some are of wide extent. It was in one of these huge depressions that the Albatross found clay. Between Nukahiva Island, in the Marquesas Archipelago, and San Francisco a basin several hundred miles in length and width was discovered during the cruise of this ship. When the sounding cylinder reached bottom at that well-filled basin, the wire had run out a length of about three and a half miles; and when the sounder came up it contained a quantity of red clay and manganese—two materials used by the maker of clay products.

This "ready-mixed" material extends over the bed of the great basin, occurring in slabs and in small nodules, and often contains bones and teeth of fish.

There is no doubt that these clay beds can carry off the premium for "depth and size"—they are truly "out of sight." And their combination feature can't well be beaten. There is the clay for the ware, the manganese for coloring and the teeth for making flux. Now will we have a South Sea Clay Company? If so, the stock will certainly be watered right up to the limit; and there will be another "South Sea Bubble." If anything happens in this line we will hold the Fish Commission responsible. They are great people for hatching out fishy things.

The clay in the deep "pockets" of the sea should, according to the nature of things, be very hard—not because it is mixed with

manganese and fish bones and teeth, but on account of the great weight of water above it. This pressure is so ponderous that no human being, though outfitted in any kind of diving apparatus, could live at bottom for a moment. At such immense depths water forces through some very compact substances, and is extremely cold—not freezing, of course, but altogether too cold for a "bath," even for many kinds of fish.

Once the heavy sea pressure was demonstrated in a not satisfactory manner to the "demonstrators." The officers of the old Fish Commission steamer Fish Hawk, while at sea one Fourth of July, desired to open a bottle of champagne in honor of the occasion. They also wanted their extra liquid cold. So the bottle was secured to a sounding line and lowered down to old Nep's cold-storage domain, where it was allowed to remain until the desired effect was gotten. Then the bottle was drawn up, the cork "popped" and the sparkling spirit of the grape distributed to the patriotic expectants. They raised their glasses and swallowed —only one swallow—and then abandoned that champagne. It was highly seasoned with a fine brand of old Nep's best salt water. This had forced through seal and cork; and it took away a fine frill from that Fourth of July feast. Moral: Champagne should be taken "cum grano salis"—in the abstract, and not from the sea.

When a bottle of once good hilarity-maker thus comes out of the sea to belie the music of its popping, it is as "lifeless" as the fish that, when brought from way down below, "pop" when they reach the surface; their eyes pop far out of the head and their bodies enlarge. The relief of the great pressure of their habitat turns them suddenly into permanent expansionists; whereas, before coming to the light, they were somewhat hidebound. The squid is another curious inhabitant of the deep, because it lives at depths of much pressure, and yet has a very soft body. The explanation of this is, that the water passes through the porous flesh of the fish, which, in great measure, is thus relieved of the crushing force.

One of the very interesting products of the South Sea is the maker of atolls and coral islands, the coral polyp, a minute marine animal that surrounds itself with calcareous matter, budding out, one from the other and producing various beautiful shapes in the substance deposited, representing leaves, branches, fans, etc. Myriads of these little laborers attach themselves to rocks, then build, one upon another, unseen as the years roll on, and then, behold! the sea begins to ripple about the growing island that now glistens in the sun; shells and other matter collect there; stray cocoanuts and other germ-bearing flotsam make lodgment, and soon green fronds are waving to the waves that lap the coral shore, murmuring the song of a new creation.

Then comes the savage, the red Columbus, in his dugout, seeking for fairer fields afar; fruit and fish and fiber are his for the taking; and here he sits him down in contentment 'till the white man comes with the burden of civilization. Then the burden is the Indian's, without the asking; and the land is the white man's—also without the asking. But the polyp labors on—and asketh nothing.

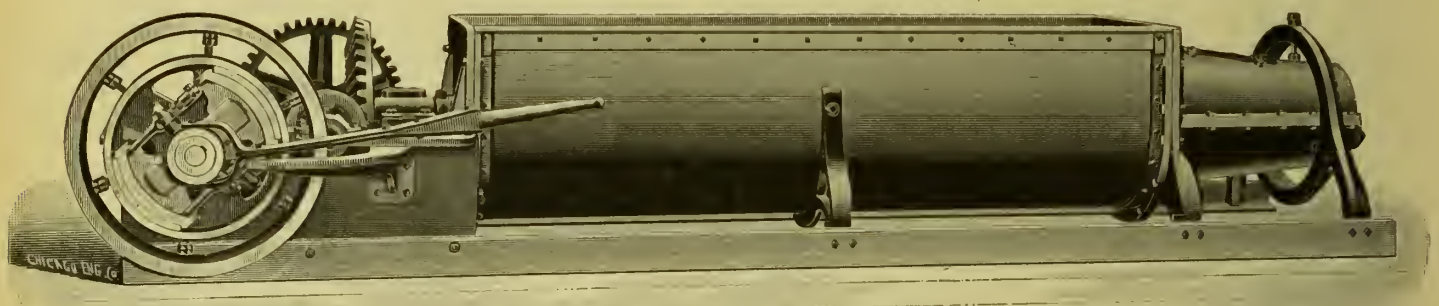
J. E. Price.

The Brewer No. 3 Pugmill.

We herewith illustrate a recent addition to the machinery made by H. Brewer & Co., Tecumseh, Mich., in what is known as the No. 3 pugmill, and a brief description of this machine will be of interest to our readers. It is constructed of the best materials, and has a 30-in. shell made from ¼-in. sheet steel without points or rivets. A heavy bridge tree cast in one piece carries the driving pulley, gear, and one of the main shaft, which is of 4-in. square steel.

The front end is made with a tapering nose-piece, and all parts of the machine are firmly secured to heavy steel angles, in such a manner that the shell is relieved of all mechanical stress except that of the weight of the clay within.

In the standard 12-in.-mill the open portion is 9-ft. long, the additional 3 ft. being the length of the tapering nose-piece mentioned. The back thrust of the pugging shaft is taken by a heavy phospor-bronze bearing with a very convenient and efficient oiling arrangement. The design is executed with the idea of attaining the maximum strength and durability.



THE "BREWER" NO. 3 PUGMILL.

The driving parts are so constructed that the mill may be driven in either direction from either side, ensuring convenience in location of belting. A friction-clutch pulley is also attached, the controlling lever of which is within easy reach of the operator.

The manufacturers claim great advantages for the tapering front, stating that the open part of the machine allows ample room for the dumping, mixing and tempering, while the front guarantees a thorough final pugging and grinding before the clay is discharged. The machine weighs 7,000 lb. Further information concerning these machines may be obtained by addressing H. Brewer & Co., Tecumseh, Mich.

A new pottery company has been incorporated at Des Moines, Ia., with a capital stock of $50,000. C. N. Carpenter seems to be the moving spirit.

Extensive improvements are being made at The Trenton Potteries Co., who plants are all located in Trenton, N. J. The improvements will cost in the neighborhood of $40,000, and among them will be a new kiln department, a new warehouse and new boiler and engine rooms.

SEGER'S COLLECTED WORKS

Translated from the German Expressly for Brick

Continued from Vol. XV, No. 6, page 263.

II.—The Amount of Air and Heat Needed for Watersmoking.

It has been shown: first, that the capacity of the furnace-gas to give off heat for the watersmoking process is diminished in proportion as its humidity is increased; and, secondly, that the amount of heat which must be obtained from some other source than the furnace-gases, in order to heat the newly-set bricks to a temperature above the dew-point and then watersmoke them, is greater in proportion as the dew-point is higher.

Therefore those factors which have the effect of increasing the humidity of the furnace-gases will always have a tendency to lessen the chances of perfect success in the watersmoking process.

We have found that a large percentage of chemically combined water, and the combustion of coal with scanty supply of air are unfavorable factors of this nature. The latter factor, however, is one particularly calculated to secure the utmost economy in the use of fuel, provided the supply of air is not reduced below a certain necessary minimum.

Now that relation between fuel and combustion-gases which insures the greatest amount of heat can be more easily maintained when gas is used in firing, than when solid fuel is used, especially if the latter presents comparatively little surface to the contact of the air, and the economical use of fuel will always be the chief aim in view. Consequently the danger of producing harmful effects in watersmoking by means of furnace-gases will always be greater with gas-firing than in the annular kiln. In other words: under like conditions, greater precaution must be taken with gas firing, to prevent the condensation of the furnace-gases before their entrance into the flue, than in the ordinary annular kiln.

Let us assume average conditions for the operation of the annular kiln: for example, a consumption of 200 kg. coal; 5 per cent chemically combined water in the brick clay; and a supply of air twice as great as is theoretically required for combustion. From the tables given we shall obtain an average of 44°C. for the dew-point of the furnace-gases, that is, the temperature at which they are able to carry off in the form of steam, without precipitation of water in the form of mist or sweat, all the aqueous vapor formed during the firing from the coal and the brick material.

If the conditions under which furnace-gas is used for watersmoking are more favorable, the dew-point may sink to 26°C., or if they are less favorable, it may rise to 74°C. Therefore the bricks must be raised to this temperature by some other source of heat before they can be heated and thoroughly dried by means of the hot escaping furnace-gases, because otherwise the cold bricks coming in contact with the furnace-gas might cool the latter below the dew-point, and thereby cause aqueous precipitations in the chambers filled with green wares.

However, in order to avoid misunderstanding, I wish to repeat here that harmful results do not necessarily appear when water is precipitated, but they are liable to appear under unfavorable conditions.

Water can be absorbed in the pores of air-dried clay (more in some kinds of clay than in others) without making the outer surface wet and consequently liable to attract flue-dust and other impurities in the furnace-gases; but if acid vapors are present in the furnace-gas, these penetrate into the pores of the clay together with the aqueous vapors and may then have an injurious effect upon the coloring. However, such an injurious effect will not be produced, or at least not to any great extent, if the aqueous vapor is allowed to escape from the pores of the bricks immediately after they come in contact with the hot furnace-gas. This will be the case when they have previously been heated to the dew-point of the furnace-gas in such a way as to prevent their suffering from it, that is, by special fires, which permit the access of sufficient air to carry off easily all aqueous vapors formed in this heating. This result is secured in the watersmoking fires in periodic kilns, and generally in continuous kilns, by supplying warm air through a smoke-flue.

If we say that 40°C. is the average temperature to which the bricks in the annular kiln must be raised, in order to bear the contact with the furnace-gas without injury, and 15°C. the temperature at which they are set in the kiln, then in the preliminary heating the temperature must be raised 29°, or in round numbers 30°C.

This heating is accomplished mainly by two factors: the heat radiating from the walls and floor of the kiln, and, if this is not sufficient, the heat secured by separate fires in the wicket doors, by special smoke canals above the fire holes, or by the introduction of warm air conducted from the cooling chambers of the kiln through smoke-flues.

Before passing to statistics on the quantity of heat required for this purpose and on the volume of air necessary to carry the heat and carry off the vapors simultaneously formed, it seems necessary, in order to make the subject perfectly clear, to present some principles and laws of heat with which the practical manufacturer is not always familiar.

It is known to everyone, of course, that temperatures are measured by the thermometer and (the higher degrees) by the pyrometer; we shall assume that the construction of these instruments is understood and also the principles upon which the scales are arranged and graduated.

These instruments are designed to indicate merely the intensity of the heat, and do not give as yet any standard for the amount of heat which has been developed from any definite source of heat or collected in a definite heated mass. An illustration will make this plainer.

Imagine a certain source of heat as a gas flame or an alcohol lamp used to heat a dish filled with water, adjusted so that all the heat derived from the flame can be conducted into the water, all waste being avoided. Suppose the dish which is to be warmed

contains 10 kg. water and the flame beneath it is able, in one hour, to heat these 10 kilograms of water from 0°C. to the boiling point, that is, 100°C.

It can be shown now by experiment that, if the dish contained twice as much water at 0°C., it could be heated only to 50°C. in the same length of time, and 100 kg. water could be heated only to 10°C.

But in all these cases, assuming that the flame remains unchanged, the same amount of heat has been evolved and transmitted to the water although the thermometer has not registered the same number of degrees. Therefore we see that the amount of heat evolved is expressed not merely by the increase in temperature indicated by the thermometer but also by the amount of heated water, since the degree of temperature multiplied by the number of kilograms of water gives the same result in each case.

In order to combine these two factors, the temperature and quantity of the heated substance, in a single expression for the measurement of the heat proceeding from any source of heat, it has been agreed to take as the unit in measurements of heat the amount of heat absorbed by 1 kilogram of water while its temperature is being raised from 0° to 1°C.

This amount of heat is called a thermal unit or calorie. In the illustration given therefore the amount of heat evolved from the gas or alcohol flame would be expressed as follows: 10 kg.× 100°C., or 20 kg.×50°C., or 100 kg. ×10°C.=1000 thermal units.

It is evident from the foregoing explanation that if 1 kg. of water at 0°C. is mixed with 1 kg. water at 100°C. the result will be 2 kg. water at 50°C. The case is different, however, when substances of different kinds are mixed together and the temperatures allowed to become equalized. If 1 kg. water at 100°C. is mixed with 1 kg. mercury at 0°, the temperature of the mixture is not 50° but 98.8°C. This is due to the fact that equal weights of all substances do not require the same amount of heat to raise their temperature 1°C., and that much less heat is absorbed by 1 kg. of mercury than by 1 kg. water.

Starting from water, which of all known substances requires the most heat to raise its temperature 1°C., and taking this as a unit, it has been demonstrated by very delicate experiments how much heat is required in the case of many substances to heat 1 kilogram 1°C. The number thus determined is in each case the specific heat of the substance.

The specific heat of the substances with which we are concerned in this discussion is expressed by the following figures:*

Water	1.0000
Atmospheric air	.2669
Oxygen	.2361
Nitrogen	.2754
Carbon monoxide	.2884
Carbon dioxide	.2210
Aqueous vapor	.3010
Burned clay (the mean average of three different varieties	.2083

That is: 1.0000 thermal unit is required to raise the temperature of 1 kg. water 1° C., .2083 thermal unit is required to raise the temperature of 1 kg. of burned clay 1° C. and .2669 to raise the temperature of 1 kg. of atmospheric air 1° C.

The above data enable us to calculate the amount of heat required to increase the temperature of any given weight of a substance by a certain number of degrees, or to find the amount of heat lost by any substance in cooling a certain number of degrees. In order to express this amount of heat in thermal units it is only necessary to multiply the weight (expressed in kilograms) by the difference in temperature, expressed in degrees Celsius, and the specific heat.

One cubic meter of air weighs 1.299 kg, at 0° and 760 mm. barometric height. To heat a cubic meter of air 100° C. therefore, 1.299×100×.2669=34.56 heat units are required, or as much heat as is required to heat 34.56 kg. water 1° C., or 1 kg. water 34.56° C.

In order to heat a brick weighing 3 kg. 100° C. 3×100×.2083= 62.49 heat units are required.

An unburned brick containing 3 kg. clay (burned), 5 per cent or 15 kg. chemically combined water, and 5 per cent hygroscopic water would require in order to be heated 100° C.;

3×100×.2083=62.49 heat units for the clay,
.3×100×1.000=30.00 heat units for water contained in it.

Total.....92.49 heat units.

It is a well-known fact that when water is heated in an open dish, its temperature rises constantly until it reaches 100° C.; from this point on the thermometer shows no increase even if the supply of heat be increased, but all the additional heat is employed in changing the water from a liquid to a gaseous condition.

Our measurements have shown that, while 100 thermal units are required to heat 1 kg. water to 100° C., a much greater quantity is needed for evaporation—namely, nearly 5½ times as much (540 thermal units), which is imperceptible to our senses and to the thermometer.

These 540 thermal units are called the latent heat of the vapor (hidden heat). There is required, therefore, all together 100+540= 640 thermal units to convert 1 kg. water at 0° C. into vapor at 100° C. On the other hand this latent heat appears again as free heat when the vapor is condensed, since 1 kg. of aqueous vapor when it is changed into liquid water, gives enough heat to raise the temperature of 540 kg. water 1° C., or of 5.4 kg. water from 0° to 100° C.

It has been found, furthermore, that if water is changed into vapor at a lower temperature than the boiling point, the quantity of latent heat remains unchanged and only the free heat shows a corresponding diminution. So if water is vaporized at 20° C., 20+540=560 heat units are required for the formation of this vapor, or 50+540=590 heat units are required to vaporize one kilogram of water at 50° C.

After this digression we will return to the application of the laws to a particular case. We had assumed that a brick clay contains, on an average, 5 per cent of chemically combined water, and that the temperature of the green bricks must be raised 30° C. before they can safely be brought into contact with the furnace gas of the kiln. Add to this another 5 per cent of water, which is retained in air-dried bricks, and the composition of 1,000 raw bricks will be as follows, assuming 3 kg. for the weight of each burned brick: 3,000 kg. clay (burned), 150 kg. chemically combined water, which is expelled only in the red heat, and 150 kg. water, which is to be removed by watersmoking, a total, therefore, of 3,300 kg.

The consumption of heat in raising the temperature of this amount of clay from 15° to 45° C. is as follows:

3000×30× .2083=18,747 heat units for the clay,*
150×30×1.0000= 4,500 heat units for the chem. comb. water,
150×30×1.0000= 4,500 heat units for the hygroscopic water,
150×540 =81,000 heat units for the latent heat of the vaporizing water.

Total.....108,747 heat units.

*Measurements of Schinz, Compendium of Heat (Compendium Warmemesskunst).

*According to Person it would be more correct to take .474, the specific heat of the solid water or ice, but for the sake of simplicity I have taken that of the volatile water, since the final result is not altered essentially thereby.

If this heat were generated by direct combustion—that is, by means of water-smoking fires, started at the wicket-doors, or by means of water-smoking kilns, the consumption of fuel used in producing this effect would be as follows; since it has been found that 1 kg. coal develops on an average 7487 thermal units, and 1 kg. wood 3878 thermal units during the combustion:
108.747÷7487=14.5 kg. coal, or 108.747÷3878=28 kg. air-dried wood.

Tiles for Slates in China.

At the risk of imitating Artemus Ward, I must commence my account of Chinese slates by stating there are none, writes a special correspondent of the Slate Trades Gazette. Slates are not used, as far as I can gather, because there are none to use. The fairy presiding over the distribution of geological favors seems to have passed China by. Hence, the Chinese, in giving their reasons for not using slates, may imitate the French priest who said he had twenty reasons for not ringing his church bell when the King passed through his village. His first reason was: "We have no bell."

The Chinese have no slates; had slates existed in the country, no doubt the Celestials would have found out the use of them, as they have of every other natural product of their astonishingly rich country. Failing slates, they early took to roofing their houses with tiles. These are used universally, except in the poorer class of houses, which are thatched with straw or reeds; or, in the case of the huts of the huge beggar population, with anything that comes handy. I have seen a roof made of an enamelled iron advertisement of Nestle's Milk, some straw, old tarpaulin, a side of a Gossage's soap-box, the lid of a kerosene oil tin, and some sods. A patent for that roof is about to be applied for!

Apart, however, from artistic roofs like this, Chinese houses are roofed with ordinary tiles, of which, though no expert, I cannot speak well. They seem to have all the vices capable of being possessed by tiles. They are invariably black, and of very coarse, gritty clay. This shows itself in the surface texture, which is rough and sometimes even covered with sharp points, so that the finger might easily be slightly torn as it is passed over. Their capacity for absorbing moisture is enormous. The only parallel I can find for it is that of an inveterate toper for liquid. I should say that a Chinese tile easily holds its own weight of water. Those of good quality cost five dollars (10s.) a thousand. Those of poor quality cost three dollars a thousand. The surface of a cheap tile would make a capital file, it is so rough.

In laying them, the Chinese have not learnt the art of pegging them. Each tile is held in its place by the weight of the tile above it. It can easily be seen that to enable the tiles to keep their places at all they must overlap one another very considerably. They do so, in fact, to such an extent that each tile overlaps quite three-quarters of the one below it. The result of the extreme porosity of tiles, and of this want of pegging, is disastrous for the roof in two directions. First, it adds enormously to the weight of the roof, and in the case of a large building it is normally great, and when rain falls heavily, as it can do in China, the weight is something terrible, often leading to the complete collapse of the building.

When Shanghai was first founded, Chinese tiles had to be employed for foreign houses; but the advent of galvanized roofing—cheap, clean, fast, secure—is becoming universal for such houses. This may be grievous news for the master slaters of Great Britain, but truth must out. I am writing this shielded from a heavy rain

AN EXAMPLE OF CHINESE ROOF TILING.*

*Obtained through the courtesy of the Stone Trades' Journal, London.

by a galvanized roof. Another consequence of the loose character of Chinese slates is that Chinese roofs are in a chronic state of disrepair. They never look tidy, as cats, in their nightly gambols, displace the tiles. The roof is a favorite place for the Chinaman, in hot weather, for fresh air; he climbs the roof to gain a vantage point to witness fires, and every step across a roof displaces a tile or two. If a typhoon does manage to get under a tile, it plays havoc with the roof, and from one cause or another these Chinese roofs always look untidy. The country ought to be a paradise for that bete noir of the slater, viz., the "jobbing bricklayer." But a roof must show daylight through it before the average Chinaman will have it mended. He is like the Irishman with whom a traveller remonstrated one day on the state of his roof. "Why don't you mend it?" "I can't," said Pat, "it's wet." "Why, then, don't you do it in dry weather?" "Sure," said Pat, "what's the good when it's dry." Only, the Chinese have the pull over Pat as to the weather. In this climate, with its months of splendid dry weather, roofing is not of the importance that it is in Britain.

I have not seen any tiles shaped like the English red pan-tiles. They are all simply concave, and are laid one on the other with the concave side uppermost. They are laid in lines, with a gutter between each line, as the illustration will show. The bottom tile of each row is slightly raised by a closed end, upon which appears designs, beautifully chased, of flowers, or gods and goddesses, and these give a pretty finish to the roof. As to the laying of tiles, a Chinese contractor tells me that a workman will lay about half a faung a day, a faung being about 10 feet square. This means that he lays 200 tiles a day. Wages are low. A man earns 30 or 40 cents a day (6d. or 8d.), according to circumstances.

The illustration will show the method of Chinese tiling, and the distant roof will exhibit another most extraordinary method of forming a ridge in the cheaper style of roofs. The tiles are set up edgeways all along the ridge. This of course, adds enormously to the weight.

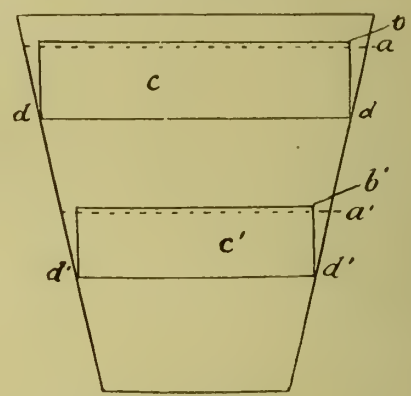
In conclusion, I may add that while my description of ordinary Chinese roofs is, I think, correct, I must in justice say that when all the lines of tiles are in order they look well, while the roofs of the temples are frequently very beautiful. On quite ordinary temples and guild houses the ridge of the roof has the most attention lavished on it. The ridge of the Guild House of the Shansi Bankers in Shanghai is made of exquisitely colored porcelain. The symbol of the sun is in the center, with a sacred dragon at each side. Such roofs, with their yellow, red, and blue tiles, with their quaint dragons and monsters, and their graceful upturned gables, are as fine as any in the world; while one of the great temples in Pekin, with its roof of delicious sky-blue tiles, is one of the sights of the world—that is, if the allied troops, during their civilising (?) campaign in that city, have not totally destroyed it, and robbed the world of one of the choicest productions of human art.

Brick Immersion Tests.

A short article was published some time ago in our contemporary, the British Clayworker, in reference to brick immersion tests, a short review of which may interest our readers.

The older experimenters with the different physical properties of brick used to place the brick under an air pump and having (as they thought) exhausted all the air from it they proceeded to immerse it in distilled water. That was all very fine for merely theoretical work but when the engineers arrived whose time was limited by the exigencies of practice, they simply dumped the brick into a tub of water, weighed it before it went in and after it came out—the difference indicating with sufficient accuracy, the porosity of the brick. As time went on however, the engineers and architects who were interested in the subject came to the conclusion that some allowance should be made for the time of absorption but they were on the wrong track when they established as a base—the longer the brick stayed in the water, the more water it absorbed.

The chemists at that time had also something to say and that was that bricks contained as a rule, a considerable amount of matter which was soluble in water so that the absorption tests ought to be considered pari passu with a loss of solvent material, the amount of water having to be reckoned to obtain anything like the true absorption, or in other words, they held that the brick subjected to the action of water lost soluble material as it absorbed water.



A BRICK IMMERSION BUCKET.

The writer after having conducted many tests on the absorptive capacities of the different kind of bricks showed that none of the methods employed could effect an accurate result. At a very early stage in his work he discovered that when the brick was placed in water it was increasingly difficult for the air to escape from the pores of the brick according to the depth of the water above the brick, and the same brick placed in water 3 ft. in depth gave a different result when only immersed 6 in. To overcome this difficulty he devised a plan of leaving one of the long, narrow edges of the brick just above the surface of the water—the remainder of the brick being immersed. The water entering the brick on its immersed sides tends to expel the air from the free surface above the water. He further saw that something was lacking in that the bottom of the brick always rested on a flat surface precluding the water from having free access to that portion of it. This obstruction he met with the method shown in the accompanying diagram. The vessel containing the water is bucket-shaped—wide at the top and narrow at the bottom. It is designed to take both large and small bricks. Let a represent the water level, c, the brick and b, the surface of the brick just projecting above the water. It will be obvious that the only parts of the brick which touch the containing vessel will be situated at a, so that the water has free play to enter the bottom and sides of the partially immersed brick. In dealing with bricks of small size, it is only necessary to lower the water level. The water lost by evaporation would have to be replaced during all long time-tests and if necessary, a chemical examination of the water could be made at the end of the test to discover if the brick had suffered from dissolution by chemical means which however, would seldom be required as the difference in weight obtained in this improved absorptive test, would be sufficiently well marked to tell its own tale.

The Cresco (Ia.) Brick Works during the past season has shipped over 800,000 brick.

The Barberton (O.) Pottery Co. has completed the foundations for its proposed plant, and work on the erection of the buildings is progressing rapidly.

Brick Paving on Superior Street, in Duluth, Minnesota.

BY W. B. PATTON, CITY ENGINEER.

Duluth, the third largest city in Minnesota, had a population of 52,969 by the census of 1900; the present estimated number of inhabitants being about 60,000. The city is situated on the north shore of Lake Superior, and the bay and river of St. Louis, on land sloping, more or less rapidly, to a height of 600 ft. above the lake level.

On Superior St., which runs parallel with the lake, and is 80 ft. wide, with a roadway of 56 ft., are located the principal retail stores, hotels and office buildings, and it is also practically the only thoroughfare, between the east and west sections of the city, and consequently carries a heavy traffic.

The first paving was laid in 1888, of cedar blocks on a 6 in. concrete foundation, and gave good service until within the last few years, but lately it had deteriorated rapidly, and the repaving of the street has been urgently demanded for the past two years.

By the provisions of the city charter street improvements cannot be made unless petitioned for by 25 per cent of the prop owners, owning 25 per cent of the property to be assessed, and

A FINE BRICK STREET AT DULUTH.

the style of improvements petitioned for cannot be changed by the city council.

There was a wide divergence of opinion among the interested parties as to the kind of pavement to be used on this street; sheet asphalt, asphalt block, dressed Kettle river sandstone blocks, brick and cedar blocks, each had advocates. A very strong effort was made to secure the necessary petitioners for sheet asphalt, and for asphalt blocks, but with only partial success. When it becam evident that the asphalt advocates would fail in their efforts, a petition for brick paving, from Eighth Ave. West to Third Ave. East, a distance of one mile, was circulated, and soon received the requisite number of signatures; it was at once presented to the city council, and that body immediately ordered the improvement made, in accordance with the petition.

On May 27, 1901, the contract was awarded to Waterworth & Fee, local contractors, at the following prices:

Removing old blocks, $0.04 per sq. yd.
Concrete, $4.00 per cu. yd.
Resetting curb stones, $0.16 per ft.
Brick paving outside of street car tracks, $1.44 per sq. yd.
Brick paving between street car rails, $1.63 per sq. yd.

The total amount of different items was as follows: 27,800 sq. yd. old pavement removed, 2,563.2 cu. yd. of concrete, 8,019 ft. of curb reset, 23,301 sq. yd. of paving outside of space occupied by street car tracks, and 10,277 sq. yd. of paving inside of track space; the total cost of the work, excluding amounts chargeable to the Water & Light Department, and the Duluth-Superior Traction Co., was $60,253.46, the estimated cost on the same basis being $59,155.25.

Some delay was experienced in starting the work owing to the fact that the Duluth-Superior Traction Co. was engaged in relaying its double track electric street car line, which occupies the center of the street. This work consisted in laying 60-ft., 70-lb. rails, with castwelded joints, on a portland cement concrete beam. At first the rails were held by iron rods, passing through holes in the web, about 8 ft. centers; but owing to the trouble which they caused in laying the brick, they were dispensed with, and the rails were spiked to cedar ties, spaced about 8 ft. apart, which were bedded in the concrete and allowed to remain in place.

When the street was originally paved, all water and gas services and sewer connections were put in the curb line, but as some of the water and gas services had proven defective, the contractors were ordered to repair them in advance of the paving work, in accordance with the following specification: "The contractors must make all necessary arrangements with the Water & Light Department for tapping mains and furnishing all water and gas pipes, valves, stop boxes, etc., and must pay all charges fixed, for such work and material, by said Water & Light Department.

"The trenches shall be backfilled with sand, or sandy gravel, tamped and flushed down with water, to a point one foot below the top of concrete foundation. The sides of the trench at this level, shall be excavated six inches beyond the width of the trench, on each side, and with slopes of 30 degrees to the bottom of the concrete. This space to the level of the top of the concrete foundation, shall be filled with concrete, made, tamped and laid as specified for the concrete foundation."

The actual work on the paving finally began on July 27th and progressed with satisfactory speed until its completion the first week in October.

After the cedar blocks were removed, the old concrete foundation was gone over, and all defects were repaired. The old concrete was found to be in excellent condition, as regards strength, but in several places it was found that it had heaved, under the action of frost, the subsoil being clay, and the tile drains, placed under the curbing, having evidently failed to intercept the subsoil water. It was consequently necessary to remove these injured portions and replace them. A large amount of new concrete was also needed to bring the foundation up to grade, the street, in its whole length, having settled considerably, in one block the settlement amounting to fully six inches.

The concrete was made in proportions of one part of cement, two of sand, and four of beach gravel; the sand and cement were mixed dry to a uniform color, then made into a mortar with water, the gravel was then added, and the whole thoroughly mixed by shovels. It was then placed on the street, being brought to true grade and cross-section by means of a traveling form, running on the curbing and the near street car rail.

On the concrete foundation a 2-in. sand cushion of fine clean sand was spread and smoothed off by means of a traveling form, of the same shape as the one used for the concrete, and arranged to travel just 2 in. higher. The intersections of the cross avenues were shaped up by means of "tee" levels, and forms, sliding on strips of wood nailed to the concrete.

The specifications required the use of bricks made of clay or shale, repressed, and especially burned for street paving, vitrified uniformly and entirely through, straight, free from cracks, and other defects, of uniform size and quality, with round or bevelled edges, and in all respects equal to the approved samples in the office of the engineer. The block size, approximately 3½ in. by 4 in. by 8½in., was specified. The bricks were tested, as to abrasion, by the rattler test, as recommended by the N. B. M. A. in 1900. Tests were to be made at any and all times during the progress of the work, and the failure of the bricks, in any shipment, to stand the test, to the satisfaction of the engineer, was cause for the rejection of the entire shipment.

The successful contractors specified bricks manufactured by the Purington Paving Brick Co., of Galesburg, Ill., and submitted 50 samples. These were subjected to the rattler test, and showed an average loss of 16.8 per cent after 1800 revolutions in the rattler. In the absorption test the result was 1.04 per cent. A number of tests were made of the brick as they were delivered on the street, and the average loss in the rattler was 15.45 per cent, and the absorption 1 per cent. A very small percentage of the bricks were culled for any reason, the principal cause being shipping, due to the long rail haul or transferring from the cars to the street. Specially molded bricks, made in full and half lengths, were used on both sides of the rails of the street car lines; the bricks on the inside being molded to form a flange space, and those on the outside fitting close to the head of the rail.

The pavement was constructed with a single layer of bricks laid on edge, end to end, in courses at right angles to the line of the curbing; adjoining courses breaking joints at least 2 in., with no broken brick used except at the curbs, in making closure, or at manholes or similar structures. The right angle courses were carried across the intersections, as far as the curb line, instead of being laid diagonally as is usual, and between the curb line and property lines, they were laid parallel with the street line, that is at right angles with the other courses.

Special care was required to be used in breaking bricks, and any not broken approximately at right angles were culled, as were also all that were cracked or otherwise injured. The bricks were set at right angles to the grade of the street, and sufficiently above it to allow for settlement in rolling. It was required that the face or smooth edge of the bricks must be placed on top, and great difficulty was experienced in securing this result. It seemed impossible to compel the brick pavers to attend to this requirement, and the inspector was compelled to mark for turning, a very large number, in some cases as many as one-third to one-half of the brick in a block of the street; and one or two men were kept constantly employed in the work of turning. If on removing a brick, marked for turning, the opposite side was found defective the brick was culled. When the bricks were laid a sufficient distance ahead, they were gone over very carefully by the inspectors, and all chipped, soft, cracked, rough or defective bricks were marked for culls or turning, and the rolling was not allowed to proceed until all defects were corrected.

The rolling was done with a horse roller, weighing about three tons, and was continued until the surface was made as smooth as possible. It was found impracticable to satisfactorily roll the special bricks along the tracks, and these were brought to the uniform surface by ramming, a man with rammer and tongs, following immediately after the first grouting gang, and raising or lowering all bricks found below or above the general surface. By this means a very smooth and satisfactory pavement was secured. After the rolling was completed the bricks were again carefully inspected, and any broken, cracked or otherwise defective ones were removed, and replaced, before the grouting was started.

At each end of the paving, and at all intersections, headers were set of Kettle River sandstone, 4 in. thick, not less than 16 in. deep, and each stone not less than 2½ ft. long. They were dressed square on top surface, pointed down on both sides to the bottom of the pavement, with a good joint for at least three inches in depth; and were set on a foundation of concrete 6 in. deep and 8 in. wide.

After the bricks were rolled, the joints next to the curbs and headers, and five joints entirely across the street, every 50 ft., were filled with coal tar, heated to not over 400 degrees F. A comparatively soft tar was selected for these expansion joints, and, on grades, difficulty was at first experienced in the tar running under the surrounding bricks, and along the joints, so that the joints could not be filled; this was overcome by mixing dry sand, with the tar, until it was of the proper consistency. The usual method, of placing a board next to the curb, and removing it after the grouting was done, and then filling the space with tar, could not be used on account of the fact that the curbing, along the street, was not dressed down below the gutter line, and therefore an ir-

SUPERIOR ST., DULUTH, MINN.

regular joint, of at least one inch, was left next to the curb, and filled with tar, before the grouting was done.

The joints, and all spaces between the bricks, were completely filled with portland cement grout, composed of equal parts of portland cement and fine screened sand. The dry ingredients were mixed until of uniform color, then mixed with sufficient water to make the grout of the consistency of thick cream, and then applied in two courses, the second somewhat thicker than the first. It was kept continually agitated, after being mixed with water, until it was applied to the pavement, and was used as soon as thoroughly mixed. The specifications required that the box used in mixing the grout, should measure not over 2½ by 4 ft., the contractors, however, desired to use a larger box, with a movable end, but the results were not entirely satisfactory, as it was impossible to get the grouting on the pavement in a uniform mixture, the first outpour being much richer in cement than the last, which was frequently almost pure sand. As the contractors did not care to get smaller boxes, it was arranged to use the old boxes, but to dip the grout out in pails, and dash it upon the pavement, workmen with hoes keeping it strongly agitated while being dipped. This produced very satisfactory results. At first brooms were used exclusively, for spreading the grout, but it was found that they were liable to leave the joints only partially filled, this was overcome by using large rubber scrapers to follow the brooms. By this means the surface was left almost free from cement, while the joints were filled up flush with the top of the bricks.

After the grouting was completed, the surface was covered wi ¼ in. of damp sand, which was kept wet, and allowed to remain until the street was opened for traffic, which was from ten to fourteen days after the completion of the grouting on any section.

The contractors are required to guarantee:

"That the material used and the workmanship shall be first class throughout. The brick shall be of the best quality, as hereinbefore specified, and after the pavement is finished and accepted the contractor will maintain the same for the period of five years, from the date of final estimate for the work. During this time he will make all repairs and renewals, that may be necessary on account of materials or workmanship that may prove to be defective, or from settlements. The pavement will be considered to need repairs wherever any bricks, or blocks, shall become broken or partly disintergrated, or impaired to such an extent as to remove one-half the original width or thickness of the individual brick on top, or to remove over one inch from either end of the same, to a depth of three-eighths of an inch below its orginal surface, or wherever the surface of the brick becomes worn or broken away, so as to show a depression of one-half inch or more, when measured in the length of a 3-ft. straightedge. Wherever any part of the pavement becomes so defective and worn, it shall be taken up and replaced with new brick by the contractor or at his expense, the work of relaying to be done in the same manner as specified for the original construction.

"The contractor must make all repairs necessary, under the condition and stipulations of this guarantee, whenever notified in writing by the engineer. If he shall fail to begin and continuously prosecute the said repairs within ten days after receiving said written notice, the engineer shall cause the necessary repairs to be made and recourse shall be had upon the contractor's bond, for all of the expenses and costs of said repairs so made. The engineer shall be sole judge as to the portions of the pavement needing repairs under this guarantee."

For the purpose of insuring the conditions of the guarantee, the contractor was required to furnish a bond from an approved surety company for an amount equal to 35 per cent of the contract price of the improvement. Said bond to be for the term of five years from the completion and acceptance of the work.

The pavement as constructed has been very favorably commented upon, and is giving very general satisfaction. Many of those who were among the most ardent advocates of asphalt, have acknowledged a change of mind, and have expressed their surprise that such a smooth and fine appearing and excellent driving street could be secured by the use of brick.

Some little difficulty was at first experienced, by heavily loaded teams, in getting on to the pavement from the avenues on the lower side, which have a grade of over 11 ft. per 100, but with more experience and care the trouble has been largely overcome.

George Preferred Setting Brick.

George Sands was a setter, in a yard not a hundred miles from Galesburg and a good all-around man, liked by every one. When he married Laura Connolly, the schoolmaster's daughter, we were sorry for George because she seemed too ambitious to match George's easy-going temperament. Nothing would suit her but that on their return from their honeymoon she must start a small dry-goods store which she tended while George was at work. At nights, after he had removed from his person all traces of the plastic art she expected him to help in the serving of customers, and George hated that job like poison.

One day, however, Mrs. Sands took sick and George stopped off work to attend to the shop and thus keep her mind easy. He had a daisy time matching wools and hunting for different sizes of buttons and every time the shop was empty the atmosphere was tinged with an exceptionally vivid blue. Several times he felt inclined to shut up the shop, but his finish came when the parson's sister, recently graduated from Boston, walked in and expressing a preliminary regret at Mrs. Sands' indisposition, fusilladed him with this:

"Mr. Sands, it is my desire to purchase a pair of elegant elastic appendages, capable of expansion and contraction by means of oscillating, burnished steel appliances of such a degree of lustre as to shine with a brilliancy of diamond intensity, the same to be used in sustaining in their position the silken habiliments which cover the lower extremities which innate modesty and delicacy prevent me from referring to by their habitual appellation."

The lurid light in George's distended optics caused her to leave the premises with undignified precipitancy, and although George has recovered from the three weeks' sickness which followed, there is no man that can persuade him after this that setting brick is not a superior occupation to keeping shop.

Chisholm, Boyd & White Co., Chicago, Ill.

This company has issued its catalog No. 9, illustrating the Boyd brick press, 1897 model, and its self-contained dry pans. The Boyd brick presses were first introduced to clayworker in 1888 and the first machines built are still in service, and doing satisfactory work. The Boyd press has long been known for its adaptability to work the various kinds of clays and shales used in the manufacture of high-grade pressed and ornamental brick, common brick, fire brick and fire brick shapes. The plant is situated at 57th and Wallace Sts., Chicago, covering about five acres. The feature of the works which is the most attractive to the visitor is the machine shop which is possibly, one of the most perfectly equipped shops for heavy and accurate work in the country. There is also a fine testing department with ample facilities for practically testing clays and shales for brickmaking purposes.

The new self-contained dry grinding pans are constructed entirely of iron and steel and are provided with a friction clutch pulley, steel gearing, rollers supported by independent yokes, and fitted with hard white-iron tires 4 in. deep. The pan bottom or roller track is also covered with a removable hard white-iron plate; the screens of large capacities are made of perforated steel plates, and as there are no sweeps under the pan a large saving in power is effected, as the clay falls by gravity to the elevator boot. This style of machine is made in four sizes 6, 7, 8 and 9 ft. in diameter.

A copy of this attractive catalog which is copiously illustrated may be obtained from the manufacturers. When you write, mention "Brick."

Brick manufacturers of Akron, O., are inundated with orders, and in consequence, Canton yards will turn out large quantities of brick to be used in Akron. The Webster, Camp & Lane Co., which is building a large plant in South Akron is receiving daily shipments of brick from Canton.

The operative potters of East Liverpool and Wellsville, O., have contributed the sum of $300.80 toward the fund for the McKinley State Memorial. At the time of the funeral of the late president the employes of the potteries in these cities contributed floral offerings with equal liberality.

The Des Moines (Ia.) Clay Works Co., whose new plant for the manufacture of electric light conduit pipe, hollow building blocks, fireproofing, etc., was recently started with four kilns in operation, is planning to build eight additional kilns in the spring, and to add pottery wares to its list of products.

Continuous Kilns.

BY ARTHUR E. BROWN, B. SC. LOND.

PART I.

It is frequently a source of wonder to us in England that continuous kilns have not found a wider adoption in such a go-ahead country as America. On the whole, it may perhaps be considered a good sign that they have not, but still it is remarkable that American inventive genius has not tackled the matter with success. The future will see them adopted, perhaps universally, for in common with all fuel-saving appliances, the decrease of the fuel stores of the world will render them essential.

The high-class character of the brickmaking trade in America is partly responsible up to now for the fact that so few continuous kilns are used, for the practice of continuous kiln construction and use has only in recent years reached a moderate excellence even in Germany, the land of its birth, and we in England are still far behind both the Germans and the French in our knowledge of its capabilities.

There is no denying, however, that continuous kilns do not yield the uniformly excellent results that can be obtained with the down-draft kiln and that therefore the man who makes only best goods is wisest to keep to the safe side rather than incur expense on an uncertainty. The man however, who produces at the same time some percentage of common brick is undoubtedly wrong to keep to the older forms of kilns which are so extravagant in fuel consumption. For modern practice on the continent of Europe is now sufficiently advanced in the matter of continuous kiln handling to ensure an output of much greater perfection than formerly, or than in England at the present time.

It is no part of the writer's intention to advertise in these papers his own recent improvements in continuous kilns. The editor has been good enough to give a careful description of these in a recent number and beyond referring to this description (See "'Brick," Nov., 1901) the Brown kiln, not yet very largely tried, need not be mentioned. The future will show whether the improvements in it are as substantial as the inventor hopes and believes and has in his own English brick yards found to be the case.

Principles.

In giving some short account of the principles of the continuous kiln, the excuse must be made that there are many busy manufacturers who have but hazy notions of them, though doubtless the greater portion of the readers of "Brick" are quite "au fait" with the subject.

The Diagram.

The explanatory diagram as a rule is of an annular shape. The kiln of the present day, however, is not annular but strictly rectangular. In France and Germany the semi-circular ended kiln is no longer constructed. Therefore the diagram (Fig. 1) here shown is rectangular. Sixteen rectangular chambers are indicated by containing lines, though the lines dividing the chambers may or may not have any solid counterpart in the actual kiln. Each such line has in all cases a temporary though not necessarily a permanent existence every time the adjoining chamber is filled. The chambers are in two parallel rows, which communicate at each end in a manner to be described later.

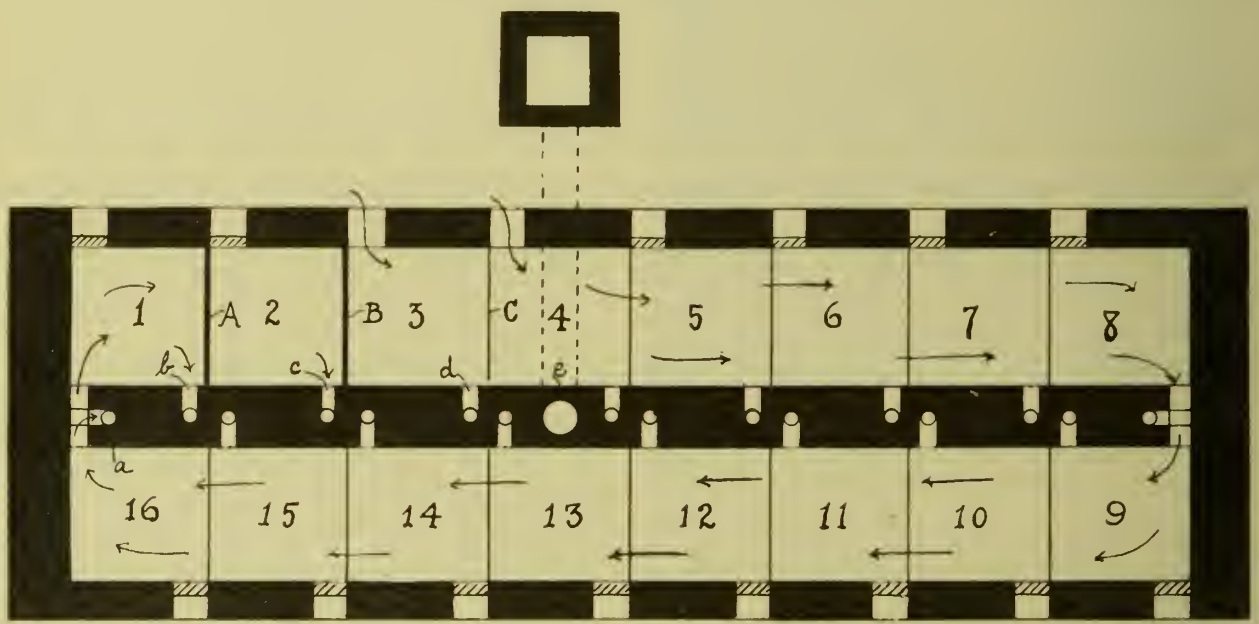


FIG. 1.

It will be supposed that the kiln is in full work, giving its regular daily output of burned bricks. In the diagram the chamber, No. 13, is supposed to be at full heat and the others at varying temperatures. The current of gases of combustion takes the direction of the arrows. It is a longitudinal current, such as is found in the "Newcastle" and "Kasseler" among intermittent kilns.

Of the 16 chambers all are quite full of bricks except No. 3 and 4, the former of which is being filled with green goods and the latter emptied of cold burned goods.

The doorways or wickets of the chambers are all closed except those of Nos. 3, 4 and perhaps 5 and the outer air can therefore enter the kiln only by these doors.

Air Currents.

Supposing the "barrel" type of kiln to be the one in question there are no walls between the chambers, but temporary ones of

strong brown paper are made at A and B as indicated by the thick lines. In consequence of these paper partitions no air can enter chamber No. 2 so that that which does not enter the open doorways must travel to the right as indicated by the arrows. This being the only means by which air is admitted, it follows that it is partly employed when it reaches No. 13 for the combustion of the fuel. As it travels, compelled to do so by the draft of the chimney, it will be observed that it passes through succesive chambers before reaching No. 13, each hotter than the one before it. The air therefore picks up heat from the burned goods in these chambers, serving to cool them, recovering the heat from them after it has served its purpose and becoming itself heated to such a high temperature that it is in a condition to produce efficient combustion of the fuel when it reaches No. 13.

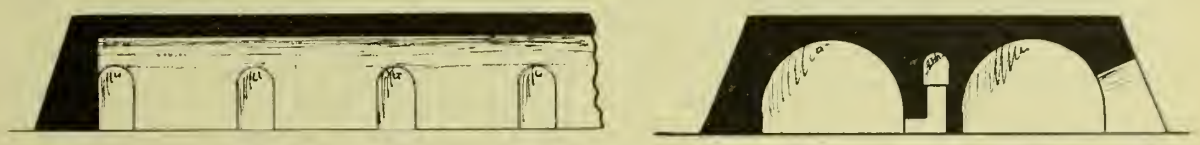


FIG. 2.

Smoke Current.

The air after having passed through this burning chamber into which coal is fed at intervals, and now mixed with the products of combustion or "smoke" of the fuel, still travels forward through chambers 14, 15, 16 and 1, but as these chambers have not received any fuel since being set with green goods the only heat they have is that which has been yielded to them by hot air and "smoke" received, as now, from preceding chambers. No. 14 has received heat in this way the longest and is therefore the hottest; No. 15 is less hot, and so on until 1 is reached, which is only at a temperature of about 120° F.

The current of air and "smoke" in question, therefore, after leaving the burning chamber No. 13 now yields up a portion of its heat to each successive chamber in its passage, until when it reaches the end of No. 1 it is so far cooled that for reasons to be explained later it must be rejected and allowed to find its way to the chimney. It there completes its work by serving to create the draft. The air, then, enters the open doors at, say, 50° F., gets warmed as it travels to, say, 1700° F.; gets a large increase of heat from the fuel in chambers 12 and 13 to about 2200° F.; and thenceforward loses heat again, till, when it leaves No. 1, it is at a temperature of about 200° F.

FIG. 3.

The Continuity of Burning.

Now it follows from this that in due time No. 13 becomes sufficiently hot for the bricks to be burned, and that No. 14 is nearly so but not quite. Fuel is therefore added now to No. 14 in a gradual manner and the addition of fuel to No. 13 becomes less and less frequent till when No. 14 is at fuel heat, no more fuel is added to No. 13. The chambers in advance are continually getting hotter, and those behind cooler, so that another chamber of green bricks may be added in front and another of burned bricks emptied behind. These processes as before mentioned are going on in Nos. 3 and 4, so that this necessity is provided for and the fires advance at a given speed.

Advance Warning.

Meanwhile chamber No. 2 has been undergoing a process called "advance warming" or "advance drying" in a way to be described immediately. When this chamber is required in the circuit of the smoke, the partition A is destroyed. The newly filled chamber No. 3 has a similar partition formed at C so that it is now isolated between two paper partitions, B and C, as No. 2 was previously by A and B. No. 3 then undergoes the "advance warming" process preparatory to being included in the main circuit of air and gases.

Each chamber is provided with some form of opening or openings leading to the chimney. Each such opening is provided with a damper by means of which it may be opened or closed at will.

In the diagram a, b and c are the smoke flues to the chambers 16, 1 and 2 respectively. These, and those for the other chambers, all lead into a large flue which communicates with the chimney, as shown at e or in any other convenient way.

Now in the state of things described, when No. 13 is burning, the three smoke flues a, b and c are all opened to the chimney by their dampers being raised.

Smoke escapes by way of a and b, but no smoke can as yet enter No. 2, the object of opening damper c is to suck hot air through the chamber to warm or dry the bricks in it before any smoke is allowed amongst them. This is done by arranging a special set of flues in the kiln so that every chamber can be put in communication with any of the others at will.

In the case in point the chamber No. 2 would be put in communication with No. 6 or No. 7 and the effect would be that a small part of the air which enters from outside and passes through Nos. 5, 6, 7, &c., would be drawn off and made to pass through No. 2. We have already seen that the air so passing becomes warmed and it is usually taken off for this advance warming process at a point in the kiln where it has reached a temperature of about 250° F.

The balance of draft pressures in the kiln is such that the chimney is able to suck a current of hot air in this way out of one chamber and along flues to one where it is needed. Its speed is usually about 175 lineal feet per minute and its volume depends on the size of the flues provided for its passage.

The Reason of Advance Warming.

It is perhaps expedient to explain at this point, why this advance warming is necessary.

It can be done in other ways but it will be clear from the foregoing that in this method the hot air is not only hot but dry.

Now the smoke of the main circuit is not dry. It contains a considerable amount of moisture which it gets from the following sources—

(1) The bricks are frequently set before being quite dry.

(2) Even when quite dry at say 50° F. they contain 5 or 6 per cent of hygroscopic moisture which is given out when they get heated to 212° F.

(3) They contain further some 2 to 3 per cent of water chemically combined which is given off at about 500° or 600° F.

(4) In addition to the moisture thus taken up from the bricks the smoke contains water derived from the combustion of the hydrogen in the coal.

The sum of these quantities of water is such that the smoke contains from 2 to 3 per cent of moisture and its dew point is from 75° to 90° F according to the conditions existing.

The result of this, if the smoke comes in contact with cold bricks, is evident, for, taking the lower limit of temperature, if they are colder than 75°, some of the moisture in the smoke will be condensed on them in the form of dew, and this condensation will continue till the bricks become warmed above 75°. After this the moisture deposited will be re-evaporated.

The water by itself would not as a rule do much harm, but it always carries in solution some sulphurous acid formed by the combustion of the sulphur in the coal. This combines chemically

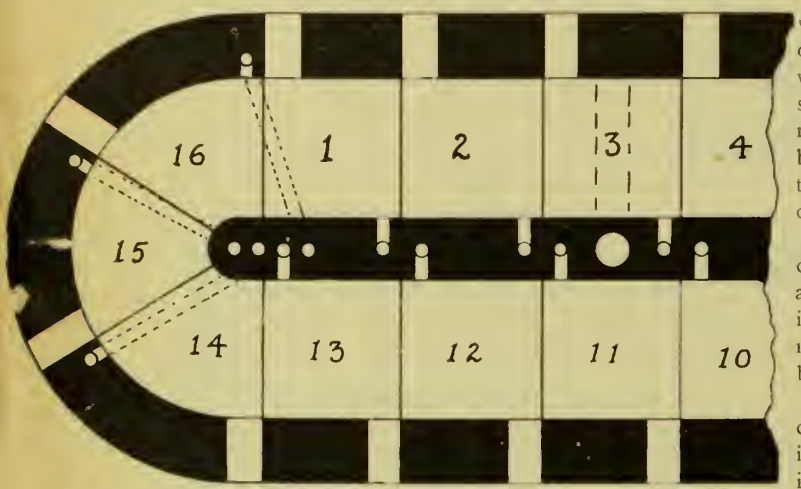


FIG. 4.

with the alumina and silica of the brick and forms a white insoluble double sulphate of silica and alumina showing on the burned brick as "scum".

Now by the "advance warming" process the bricks in a newly set chamber are warmed by a current of hot dry air to a temperature of 100° to 120°. Consequently, when the brown paper partition is destroyed and the smoke obtains access to them, they are already at a temperature at which no condensation will occur and the bricks remain clean in color and free from scum.

There is a good deal more to be said on this subject, but it must be left to be dealt with later, when speaking of the actual firing processes. Suffice it to state here that the process is absolutely essential for all high class work. It ensures good color and soundness in the burned goods and it renders the burning process more uniform and economical.

As remarked, before describing the advance warming process, the damper c serves for the passage of warm air until the paper partition A is destroyed and a new one is erected at C.

At this time the damper a is closed and d is opened, b and c now serving for the passage of smoke to the chimney and d for warm air. The whole position of affairs represented in the diagram is then reproduced but advanced by one chamber in the direction of the arrows. All the operations continue to recur in the manner described and the fire advances at a steady rate in the kiln, new chambers being continually emptied behind of their burned bricks, and added in front when refilled with green bricks.

Construction.

The construction of the coal-fired Hoffman kiln is generally in the form of two parallel galleries, long chambers arched over throughout their length. The wall dividing them may contain a third arched chamber of smaller size, the kiln flue for smoke, or it may be solid. In the latter case the smoke flue is constructed all round the outside of the kiln. The central position is for many reasons preferable. The original form was annular but was found disadvantageous for many reasons and is not now constructed.

In England, occasionally, the galleries consist each of a row of chambers arched transversely. That is to say the arches over the chambers have their axes transverse to the longitudinal axis of the kiln. At Peterborough for instance, where 600 millions of Fletton bricks are produced annually, the earlier kilns were arched in this way. Now, however, the "barrel" or longitudinal arch is usually constructed and on the continent of Europe always.

Diagrams of Types.

These two forms are shown diagrammatically in Figs. 2 and 3, where Fig. 2 shows a longitudinal and transverse section of the plan diagram (Fig. 1) on the "barrel" system and Fig. 3 on the "transverse arch" system. Some authorities think the transverse system better, but for the coal-fired Hoffman kiln the "barrel" system is undoubtedly best. It costs less, works quicker, and burns less coal. It is not proposed therefore to enter into details of the construction of the transversely arched kiln in these papers, in connection with coal firing.

The barrel kiln in England is always constructed with semi-circular or "egg-shaped" ends, the internal width being the same as that of the parallel chambers. This is shown diagrammatically in plan in Fig. 4. As remarked before this form is seldom or never now constructed on the continent of Europe because of the drawbacks found to exist.

The drawbacks are self-evident, for it is difficult to prevent short-circuiting of the draft in turning the ends with the fires and much irregularity of burning results. The construction also is difficult in comparison with that of rectangular ends.

Those without experience of the facts would think that the short circuiting of the draft would be still more difficult to prevent with rectangular ends, but it is in reality quite easy and simple. It is proposed therefore to describe minutely only the rectangular barrel form.

Determination of Size.

The first essential matter to determine is the size of kiln necessary for the output required, and there are several important factors to be considered in arriving at this.

The chief point to be known is the speed at which the fires will travel through the chambers.

This varies with

(a) The height of the arch.
(b) The number of fire holes.
(c) The properties of the clay.
(d) The size and condition of the bricks.
(e) The draft.
(f) The skill and attentiveness of the burners.

Each of these factors varies according to circumstances and must be considered separately.

(a) Stated generally the speed of burning varies inversely as the height of the arch, though not in exact ratio. A height of 9 ft. at the center of the arch must be considered the limit under all circumstances and a less height is better wherever practicable. Kilns are being constructed in Germany at the present time, without arches

in which the bricks are set to a height of 4 ft. 6 in. only and are found to burn at the rate of 100 lineal feet per week.

(b) The spacing of the fire holes has been found in practice to be most efficient for all purposes at an average of 3 ft. centers transversely and 3 ft. 9 in. centers longitudinally. If placed more closely than this the heat would travel faster, but less economically and with greater damage to the goods.

(c) A dense brick takes longer to burn than a porous one, so that if a given cubic space in the kiln contains a greater weight of one kind of brick than of another kind, the former will burn less quickly than the latter.

The amount of water in the clay, chemically combined, also influences the speed, or any peculiar constitution which may give rise to absorption of heat by chemical action.

Water chemically combined is given off usually at about 600° F and when the bricks reach this temperature there is considerable absorption of heat, which takes time to produce by the firing.

Some clays in England, when burned, reach a dull red heat and then suddenly blacken again, in consequence of absorption of heat due to a chemical change in the clay.

These influences are not of very large effect. A property however which has a much greater influence is the presence of fuel in the clay itself, such as oil in some and coal in other classes of shale. This greatly increases the speed of burning and sometimes even is troublesome to control.

(d) A large sized brick naturally takes longer to heat than a small one, and also requires more time to be thoroughly oxidized throughout its mass. The standard dimensions however are such that this factor is in favor of speed in America. In England in some districts the bricks are made objectionably thick. The other dimensions than thickness do not of course have much effect.

The condition of the bricks as to moisture has a considerable influence on the efficiency of the kiln and also on the quality of the output. The importance of drying bricks very thoroughly is almost universally underrated by brickmakers, though one finds that the working foreman usually quite realizes it.

It has already been pointed out how an excess of moisture in the kiln smoke tends to cause scum. For this reason alone it is important to get rid of all the water of manufacture from a brick before it is put in the kiln. It is additionally important to do so because such moisture retards the burning and renders it irregular in respect of speed.

For these reasons the setting of semi-plastic bricks direct from the machine in the kiln is objectionable. When it is done, special arrangements must be made for drying which will be mentioned later.

When drying tunnels are used for drying bricks it is important to ensure the complete drying of the inner bricks on the cars and not to be content to see the outer ones only quite dry.

(e) It is obvious that with a strong draft the heat will be pulled along more quickly, provided it is at the same time produced quickly enough by quick consumption of fuel. The use of mechanical means for inducing draft has been but little tried. The writer has employed it with marked success in his own kiln and the point will be dealt with later in detail.

If a chimney is used it should be of ample dimensions and upwards of 120 ft. in height in order to give efficient results.

(f) Last and perhaps most important of all is the management of the burning. Competent burners are not easy to find, but with payment by results and premiums on excellence it should be possible to ensure the minute attention to the burning operations which is an absolute essential in the burning of continuous kilns.

The Usual Speed of Burning.

The foregoing remarks seem scarcely calculated to give the answer to the question of the speed of burning. They indicate the causes that may modify it and should be of assistance in cases where unsatisfactory results are obtained. Under properly arranged conditions the speed usually attained is from 10 to 11 lineal feet per 24 hours, in kilns of moderate size.

Calculation of Sectional Area.

Given this speed the size of the kiln can quickly be calculated. For example, say that 150,000 bricks per week are required (size 8x4x2½ in.) and that the bricks when set in the kiln go 16 to the cubic foot. Then 1,340 cu. ft. of kiln space must be burned per 24 hours. Dividing this figure by 10 we find that the sectional area of the chambers must be 134 sq. ft. This is nearly given by a width of 18 ft. and a height at the center of 9 ft., the arch being semi-circular.

In practice this is a maximum-sized kiln to construct. It is in fact too large to give such uniformity as is desirable in the burning. Much more satisfactory results are obtained from smaller kilns and many are constructed in France and Germany with chambers less than half the size.

It is proposed therefore to give details of two classes of construction, the one of a kiln with chambers 14 ft. wide and 8 ft. high with sloping side walls and the other of a kiln with vertical side walls with chambers 9 ft. wide and 7 ft. 6 in. high. The former would be calculated under ordinary conditions to yield 90,000 burned bricks weekly and the latter 65,000 bricks.

The Length.

The sectional area of the chambers being settled the next dimension necessary is the length of the kiln.

The total length of the two galleries or barrels should be about 2½ times the length burned per week. It should not be less and may with advantage be more up to say three times especially with the larger kiln in which the burned goods cool more slowly.

The way in which the length is divided up into chambers by the presence of wickets depends on the question of convenience for setting and drawing.

The Number of Chambers.

As mentioned before there is no actual division into chambers in the barrel kiln except temporarily, though in some cases the insertion of a "drop arch" adjacent to the wickets is a permanent indication of the division. This is only required if the bricks shrink considerably in burning. Wickets are necessary and should be at regular intervals in the walls. The length determined may therefore be divided in this way into 14 or 16 parts or chambers.

We may then design the kilns with 16 chambers each, the large one being 112 ft. in length inside and the small one 96 ft.

Lengths of 98 ft. and 84 ft. respectively might suffice, but do not give much latitude in the working, nor sufficient time for the "advance warming" process.

An Immense Order.

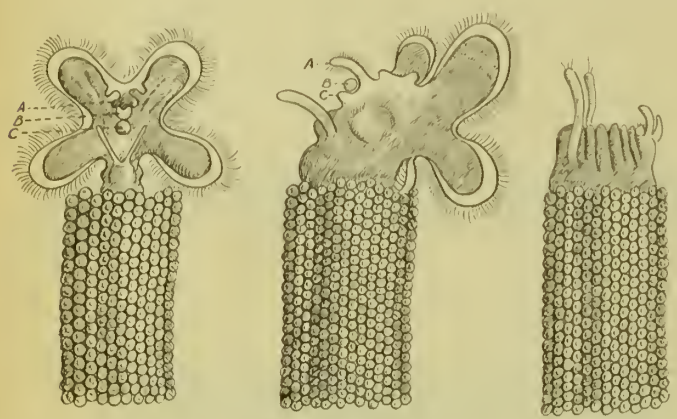
The Monterey Brick Manufacturing Co., of Monterey, Mexico, on Nov. 12, 1901, received the following letter from the Celtic and Caledonian Tank and Oil Fuel Co., of Chicago, Los Angeles and Beaumont: "Herewith we hand you our order No. 6092, for four million eight hundred thousand crimson dry pressed brick, to be delivered partly at Houston and partly at Beaumont, as per instructions furnished by Mr. Chas. G. Oglesby. Shipment to begin December 15th, specification as per sample, one of which Mr. Oglesby retains, the other is this day returned to you, also our order No. 6093 for 25,000 stiff-mud, end-cut brick, semi-vitrified, these brick to be practically absorption proof and are to be used in flooring oil tanks. Shipments to be made in January to Houston, as per specified directions of Architect Oglesby."

This tells its own story.

Madam Mellicerta Ringens, Brick Manufacturess.

Brick manufacturers are egotistic to a large degree. Each and every one of them imagines that the whole shooting match is his own and that there is none other, but they are liable to be undeceived as time goes on and the most broadminded are the ones that have been undeceived the most. There are other clay workers in the world besides ourselves, and it is the purpose of this brief article to take our readers for a short, and let us hope interesting, trip among the various clay workers of the universe.

It was our pleasure some time ago to spend an evening in the laboratory of a scientifically-inclined friend. He is the possessor of a microscope, and it was through the means of this valuable instrument that we obtained an introduction to Madam Mellicerta



MADAM MELLICERTA RINGENS
A—the chin; B—the brick in the mold; C—the molding table. A young female.

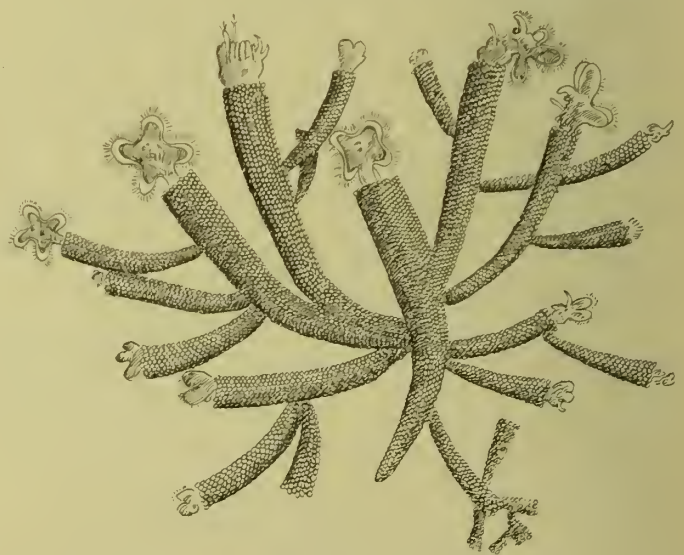
Ringens, Brick Manufacturess. There is no record of when she commenced business; there are no files of her incorporation as a company, nor are there any archives which relate to the history of her manufacture during past ages. But it is certain that if there is going to be any fight about the antiquity of the brickmaking business, Madam Mellicerta Ringens stands a very fair show of keeping the best place in point of antiquity. Yes, you may boast of your Egyptian brick unearthed in the tombs of Thebes, or found at the base of a pyramid with probable date of fro five thousand to six thousand years before Christ; you may gloat over the history of the Chinese blue paving brick, or the brick found in the great Chinese wall, but the product of the Mellicerta plant antedates all of these.

Where did you meet her? Where can she be found? Careless man! you have trod on hundreds of her as you walked along the road! You have destroyed hundreds of brick plants every time you splashed into a puddle on a rainy day, interrupting scenes of abnormal activity, reducing your fellow clay-workers to the depth of despair.

You may be surprised that we are dealing with a lady this time instead of a gentleman engaged in brickmaking, but it is a peculiarity of these little insects that the female is the best known; the gentleman is so modest and retiring that he is scarcely ever seen. It is true that he makes bricks occasionally; perhaps hard work does not agree with him, and he leaves his better half to do the shining.

A small quantity of water was placed beneath the microscope and after a couple of moments' steady gaze at the whirling mass thus revealed, the form of Madam Mellicerta Ringens become clearly defined. She looks as shown in the illustration, she has a long transparent body at the top of which is a corona of four lobes which, when viewed from the back, look slightly like a hearts-ease with its four petals lying in a plane, but a second inspection shows that the two lower lobes are bent backwards so as to form an oblique incline with the upper lobes. This corona is fringed with large cilia or hairs which move with great rapidity. This constant motion draws all the particles of matter floating in the water into two spiral currents which are drawn along a groove underneath the upper part of the head. Of these two streams, one is drawn into the mastax and eventually taken into the stomach. The other passes over the chin of the insect and its disposition you will see later. It is really wonderful to notice how this mysterious propeller fringed with cilia, moving with immense velocity, separates from the streams of water, that which is food, that which is suitable for bricks and that which is refuse. This is done without a moment's hesitation, there is no stop in the machinery, the food never goes down the wrong way, nor do the bricks. All is in order, all is right, all is perfect. The stream which goes over the chin which is also ciliated is then drawn into the hemispherical hollow which is furred with minute moving cilia. By means of these, these particles of matter are rapidly whirled round and round in these small molds. It is interesting to notice also that the motion is reversed every now and then, apparently so that the mixing may be more complete. The particles of clay, if we may so call them, are mixed with a kind of glutinous cement which issues from the fleshy knob immediately below the mold. This is a veritable pug-mill. Happy brickmaker, that carries her machine and mold with her! When the mold is nearly filled, the insect dexterously brings its chin down firmly, completing the molding of the brick by pressure against the knob beneath; it then removes the brick and lays it in position around her body.

This is what these bricks are for. When the Mellicerta Ringens is only one hour old it immediately starts to build a house for



A MELLICERTA CLUSTER.

itself, around its own body. It commences at the foot and lays bricks round and round itself, every brick of the same size; every one laid in rotation; every one of the same uniform quality, though possibly without the hard metallic ring that we consider essential. The bricks of the Mellicerta Ringens might not find a market in Chicago, but they serve their purpose nevertheless, and taking all into consideration measure for measure, they are possibly more

durable and undoubtedly more perfect. The Mellicerta at its greatest size is never more than an eighth of an inch in length, and yet, about it are laid some 6,000 bricks in 240 rows. It is one of the most common creatures that you can find in any pool and perhaps one of the most interesting. A remarkable feature about its life is this, that you can allow the water in which it dwells to evaporate and all that is left of this little rotifer is apparently a speck of dust. You can place it in water after it is dry and it will come to life again and resume brickmaking as if it had never been resurrectionally handicapped. This operation may be repeated 6, 8, 12 or 20 times with the same results.

Another interesting experiment was performed, particles of red and blue coloring matter were introduced into the water and our friend Madam Mellicerta immediately commenced building for herself a red and blue house. This was the most beautiful sight of all to witness. It was impossible to fool her that the red and blue grains were food. It tickled her female vanity too much for her to reject that as refuse and so she turned them into brick for her dwelling-house. If any of the great passions such as pride, for instance, can find a place in such a small creature, we may be assured she was the proudest Mellicerta in the whole bunch.

The Mellicerta do not always live individually, they are found in large clusters as shown in our illustration, and very commonly so, as many as 10 to 15 and 20 all being built together, one lady's foot resting on another lady's back and so on until they all seem united like the lines of a street railway. All these fulfill some great purpose in the economy of the universe and one thing that is certain, it is bound to afford instruction and amusement to those who have time and the wish to study out the clay working existence of this interesting family.

The Mellicerta Ringens is better known to the general public as the Building Rotifer. The word rotifer means to turn around and to the observer the insect seems to turn round and round and round in his building operations. Each one of these lobes with its cilia seeming to be a little wheel or screw propeller which churns the water furiously and sets up the motion necessary to send the particles in their respective channels.

Mechanical Draft and Its Advantages.

Within the past few years there has sprung up a decided sentiment in favor of forced or induced draft in land installations. The fitness for this form of draft for marine work, where tall chimneys are to be avoided, is readily conceded, and, following the precedent there established, the use of mechanical draft is extending to stationary plants.

Natural draft depends upon the difference in temperature between the gases inside and outside the chimney, and is greater accordingly as the smoke and gas from the furnace pass out in a more highly heated state. But this entails a great loss of heat which might otherwise be used to better advantage. True, says the "Practical Engineer," the introduction of an economizer into the flue space has the effect of absorbing some of this excess heat and returning it to the boiler through the water. Yet even the economizer dare not consume too much, or the temperature of the flue gases will be so much reduced as to seriously impair the effect of the draft.

Here, then, is where forced draft scores a point. By means of a fan or centrifugal blower the combustion can be made more perfect, owing to a nicety of regulation of the air supply, and therefore the gases will reach their maximum temperature. The economizer may then absorb every unit of heat that escapes into the stack, if possible, without detriment to the draft, since the pressure from the blower furnished this. By this combined installation of economizer and forced draft a saving of 15 per cent has been made in cases where fuel was dear and the feed-water low in temperature.

More than this, it costs less to install a mechanical draft apparatus than to build a suitable chimney for natural draft. And then it is possible to secure a more complete utilization of the waste heat than by ordinary methods. Poor grades of coal may be used in connection with mechanical draft to great advantage, thus lessening the cost of coal supply.

Again, there is no chance of the efficiency of the draft being influenced by the weather. If the draft tends to become weak the fan may be speeded up to keep it uniform, and if, under the stress of some sudden emergency, it is found necessary to generate more steam in a very short time, an increase in the force of the draft, directly under the control of the engineer, makes a quick response to the demand. This system is most flexible, and is adaptable to any and all situations.

Mr. Samuel S. Chisholm.

As reported in our last issue Mr. Samuel S. Chisholm died at the Majestic Hotel, in New York, on Nov. 26, 1901, at the age of 60 years. He had been in poor health for nearly two years. Mr. Chisholm was a Canadian by birth, his native town being Belleville, Ont. After acquiring the usual school education he accepted a position as school teacher in order to obtain the means necessary to enable him to get a college education. This ambition was fulfilled and later, after steady application, he graduated at a law college in Toronto. In the early 70's he came to Chicago and founded the American Miller, which is a publication devoted to flour milling interests. About 1880 he entered on the manufacture of flour mill machinery and with this business he was extensively engaged for several years. Ever a man of resource, he speedily saw a field open before him in the brick machine market and in 1888 he established the firm of Chisholm, Boyd & White for the purpose of manufacturing the Boyd brick press, and later this firm was merged into the corporation under its present title, and at the works and offices at 57th and Wallace Sts., Chicago, a large number of men is employed and an extensive business is done. Of this business Mr. Chisholm was secretary, treasurer and financial head. He was well known in social and financial circles; a member of the Chicago and Washington Clubs; he was a Christian and practiced the gospel of good will. He leaves a wife and four children, two sons and two daughters.

S. S. CHISHOLM

Funeral services were held in the chapel at Rose Hill Cemetery, Chicago, November 20th, in the presence of the family and a few of his old employes and friends. The business of Chisholm, Boyd & White Co. will continue as usual.

Frasier & Co., brick manufacturers of Mt. Carmel, S. C., will correspond with makers of brick machinery with a view to purchasing a new equipment.

Harry P. Branstetter has purchased F. S. Wisterman's interest in the brickyards at Galion, O. Numerous improvements will be made in the spring, and the capacity of the yards increased to meet the demand which at present promises to keep the plant running at full force throughout the coming season.

BRICKMAKING IN THE SCANDINAVIAN COUNTRIES

BY CHRISTIAN FR. LEGER.

VI.

In the immediate neighborhood of Copenhagen, on the western side of the town, an impulsive life is stirring. During the last years the character and appearance of this part of the town have been totally altered; enlargement on a large scale has been effected here, too, though at first highly restricted by the quay and the long entering from the Baltic in the south, which, clearly enough, put an end to all expansion in this direction. Long and dreary streets stretching from the main street towards the sea, hitherto set a stamp of their own on this quarter of the town. The barrack-like houses are holding a numerous population, among whom the laborers are strongly represented in the front, middle and rear houses, crammed from basement to attic. But the laying out of a long and broad boulevard and the filling up of the neighboring sea-area has enlarged the town territory rather considerably and opened new and fresh views to the passion for building. On the thus reclaimed area has been built a goods-railway-station, which according to our small ways is a grand affair. It has just lately been fulfilled, and has been taken into use on the 30th of September this year. In a blow this formerly almost unheeded "Westend" has become the field for an enormous traffic, for interchange of the multifarious mailings, incessantly forwarded to and from the metropolis. The endless trains are through high and elegantly constructed viaducts crossing the roads leading into the country. From the southern viaduct we have a splendid view across the entangled network of the railway lines and the imposing railway station with its ranging hill, where the cars are arranged, and where they by their own weight quickly and safely are slipping through electric driven switches to the place whither they are bound, either to be put into a train that is being arranged for departing, or they run to the numerous discharging places. But also the part of the view stretching along the sea towards the south and an already schemed prolongation of the quay is attracting our attention—and with good reason.

At a distance of about one mile from our place of view a collection of towering chimneys stand out in sharp relief against the horizon, pouring forth immense clouds of smoke over the flat country, while the lower surrounding buildings seem to form a little town, where manufacturing is the chief trade. And the high road along which we now are approaching this laboring center is clearly telling what sort of industry it is, that we are tending to look at at close quarters. Long rows of wagons and pairs are toiling towards the town loaded with bricks, tiles and stocks of all dimensions, forms and colors, chippings, gravel and sand, cut flint or granite for roads and paving, burnt lime and machine-made mortar, firebricks and many more articles. At the same time empty vehicles that have been out with their loadings, are hastening homewards to fetch a fresh stock. And all this busy traffic has its starting point at the smoke-pouring heaven-stormers of the joint-stock-company, "Frederiksholms Tegl-og Kalkværker," the largest brick-yard in Scandinavia. Its product is well known and renowned all over the country, while Norway and Sweden are consuming a considerable quantity of the finer articles produced by the factory.

FIG. 1—FREDERIKSHOLMS TEGL-OG KALKVAERKER.

This large establishment has a ground area of 350 acres, 100 of which are used for the yard, while the rest is laid out for corn and grass for the large stock of horses. It was started at the beginning of the seventies with one Hoffman kiln, intended for a product of 4,000,000 of bricks a year. The extensive clay stratum (though of so polluted and stony a condition that all of it must be slummed) and the proximity of the largest market place of the country, on which it was chiefly based, led in 1873 to the foundation of a joint stock company, whose capital, originally $240,000, little by little, has been augmented to $800,000. At the time mentioned the capacity was enlarged to 15,000,000 of bricks a year, all hand-made. Then it happened that one fine day a mighty limestone foundation was found beneath the clay, here and there polluted by flint and other matter, but still of so undoubted goodness, that the working it would surely be a considerable surplus to the business and income

of the company. Of course this new branch was instantly taken up, another continuous kiln was built, and burnt limestone was brought into the market. About the same time a special division was established for the production of machine-made lime-mortar, ready for use. Here two birds were killed with one stone, as the gravel that was slummed out of the clay on account of its no slight addition of clayey matter, afforded a highly valuable material to be mixed with the lime, and was to a high degree binding and fit for being used by masons. In the course of time this mortar has therefore become an article strongly requested by architects, who prefer it to most other compositions. For the finer work, on the contrary, such as inside plastering, pointing, coating of tiled roofs, etc., the lime is mixed with fine sand. Though as a matter of course the demand for this sort of mortar must be considerably less, compared to the quantities necessary to the proper brickwork, yet the factory has been obliged to procure quite a flotilla of boats, which all the summer are digging sand in the sea, discharging it at the quay of the harbor, that it has been necessary to dig out and construct. The digging of sand as well as the discharging it was for a long time carried on by hand, but as business improved and demand increased, this method was not sufficiently satisfactory. A digging-engine is now putting out in spring, digging out lots of sand till it returns before the autumn storms break loose. Communication is established through the factory's own steamer, towing large empty boats out to the spot where the engine is at anchor, and taking them back when they are loaded. The discharging of sand, as well as of coals and other necessities arriving by sea, is performed by dint of a steam-lift, whence they by tramways are conveyed to the mortar-division, boiler houses, kilns and storerooms, or wherever they might be wanted.

About 10,000 cubic meters of limestone are taken out, and on an average 300,000 cubic meters lime-mortar is produced a year. The lime is burned, as above mentioned, in a continous kiln, where alternately common bricks and fireproof ones are put in to keep the work going incessantly. As an example of how solid and lasting such a kiln may be constructed and built may be stated that the fire has been kept up without interruption for 25 years, until it was put out last winter for accomplishing a repair that now at last proved necessary. The burnt lime is sold to consumers in Copenhagen and environs, while part of it is sent by railway to customers in the country. The rest of it is slaked in the steam slaking apparatus for being used at the mortar-manufacture and is deposited in large tanks paved with stone; they are filled to the brim and left untouched until the lime has reached the proper age and stiffness.

That the enlargement of the original chief business, the manufacture of bricks, by no means has been neglected, but on the contrary, as far as possible improved according to the claims and technical precepts of the day, is evident. During the 30 years the factory has existed, it has grown to a considerable size, at present embracing a yearly production of 24,000,000 of common bricks and yellow face bricks. A special division is exclusively occupied in producing finer articles such as hollow "Verblendsteine," ornaments, terra-cottas, figure-ornaments, glazed vases, etc., partly in the given instances after designs of pre-eminent architects, and often produced by direct assistance of sculptors and able artists. The clay for these articles is chiefly imported from Germany, Sweden and Bornholm. In the latter place the yard has to this end acquired a property, on the precincts of which the clay is dug out. It is dried in open air and finely divided before it is molded, after which process it is burnt in Muffel-kilns. The peculiar scenery and produce of Bornholm has been mentioned in a former letter; from this part of the country is also imported kaolin for the fabrication of firebricks.

The clay for this common brick-manufacture, which at first was to be found all over the area of the yard, but which at present in spite of repeated accessions of territory from the sea most naturally shows several holes after the digging of so many years, this clay is nowhere found so pure, that it may be used as it is. It is plowed out by horses in the clay pits, loaded on tip cars and taken by rails to the four slumming-machines, self-cleaning appratus, patent Lüdiche. The deposit, about 40 per cent of the worked mass, is laid off by passing through spinning sorting-sieves; it affords an excellent road-material that meets with a ready sale in Copenhagen and nearest environs. Each slumming-machine works in a 10-hour working-day about 90 cubic meters that is caught into 21 slumming-basins; the aggregate area of these makes 700,000 sq. ft. In spite of long watering, drying in the sun and freezing through and through in winter this clay, as a rule, is too soft for working, and only by adding larger and smaller quantities of dry clay-powder it attains the necessary stiffness. This is produced by ploughing or peeling the surface of the clay-area and as far as possible drying the clay in the sun, before it is gathered and wheeled into large covered barns, where it is spread and exposed to draft. When in a perfectly dry condition it is ground and comminuted in four disintegrators, sifted to a fineness like flour or dust, and then divided for the different mixing-mills where it is wanted. The demand for this indispensable admixture amounts to about 150 cubic meters a day, varying, however, after the condition of the clay in the slumming basins. The bricks are produced by

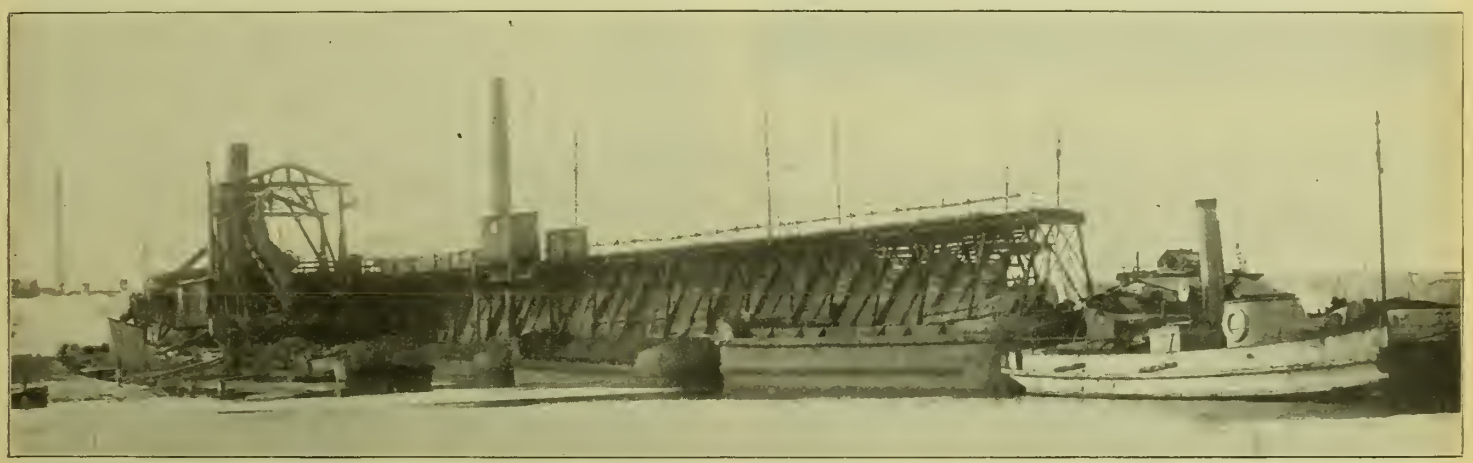


FIG. 2—THE HARBOR.

12 brick machines, each of which during the season April-October, in normal weather, turns out about 2,000,000. To be able to satisfy wishes sometimes put forth by builders and architects, or to meet a contingent want for repair of older houses the establishment also embraces a lesser quantity of hand-made bricks. The green bricks are exclusively dried by natural process in covered sheds

FIG. 3—THE SOUTHERN CLAY PIT.

conveniently placed for the wheeling away from the brick machines. The bricks are placed with so large intervals between them, that the air may circulate freely around them. As soon as the drying has been completed in this way, the bricks are either directly wheeled to a kiln to be burnt, or they are stored in large open barns, placed in a way to make the conveyance the shortest possible. To facilitate this and shield the bricks from molestation through bumps and jostles, all wheeling is performed along some easily removable single rails, conveniently placed wherever wanted. All conveyance, however, is performed on tip-cars along an exceedingly widely branching rail-net with numerous turn-plates, forming a direct and sure means of communication among the various parts of the establishment, and along which a single horse is able to remove considerable weights without being overtaxed in any way.

What especially must catch the attention of all interested brickmen is the fine and excellent produce from Frederiksholm; it is acknowledged everywhere, though the rude material is highly polluted and besides uncommonly refractory and difficult to work. The gray and blue clay that is found here, is so plastic and tough and so cohesive that it is almost impossible to free it from the stones of all sizes that it contains, the tough compactness resisting every soaking and dissolving influence. Consequently an enormous work is needed to get it sufficiently washed out, so that all foreign matter is removed to perfection and the pure clay only is left. Yet the operation is fully carried through by the excellent slumming machines permitting no extraneous matter to pass, the very finely-grained sand excepted. This careful work is of a particularly founding consequence for the further treatment of the clay, making it a docile and pliable material, yet a great deal of attention and preparation is needed, before it is fit to be used. First of all the filled slumming basins are carefully and rationally outwatered through tapping from the surface and oozing out at the bottom and sides. Then, when the clay is sufficiently stiff so as not to run, it is piled up in walls to get brittle from the sun and wind and frost. And when at last it is taken into use, the fatter parts of it, bedded furthest away from the afflux, are carefully mixed up with the leaner and sandier part just below the slumming-conduits, and at last it is stiffened with dry clay-powder. After this process the material is willing and good, and through the further preparation it is easily made into strong, tough and stiff bricks that when green may be piled into layers of 15 without being deformed. They will directly bear the strongest drying effect from sun and wind, never cracking or breaking, not even in the burning.

The buildings, machines, working and drying apparatus are arranged this way: The terra-cotta division, that partly is working quite independently of the other works, is together with the kilns placed in a row in the middle, flanked on each side by a row of drying-barns. In these are installed 12 brick machines (6 on each side) with concrete mixing pits, pugmills and other belongings. Clay is supplied along rails running through the whole length. All the brick machines are driven by a steel shaft, also going through the whole length and put into movement by steam engines, of which there are all in all 5, together evolving about 150 h. p., and besides driving all other apparatus such as pumps, disintegrators, mortar-mills, etc. Each working machine is connected by electric signal with the power-engine, so that a single signal is sufficient for regulating or immediately stopping the work. Outside the barns with the brick-machines are the open drying-sheds, and outside these again the whole yard is flanked by the slumming-basins. Thorough-going punctuality and symmetry is observed everywhere in the rather extensive yard, and under ordinary conditions, to which must be reckoned favorable and especially dry weather, everything goes straight as a line. All the kilns are of the continuous Hofmann type, partly circular, partly oval, and accommodated as to ability of production so that as a rule they are kept going all the year round. For fuel is chiefly employed Newcastle steam coal besides some nut coals and smalls.

On a yard of dimensions like this, where the machine work puts

FIG. 4—ROTARY SORTING SIEVE.

indefeasible claims to an accurate co-operation among all the special parts, and where so much comes to a stand-still, when one connection fails, it is, of course, of the greatest importance that quick and able assistance is at hand when wanted. For keeping up the materials and repairing breakages there is an excellent repairing division comprising workshops for iron, metal and woodwork.

Supplied with all modern facilities and workshop-machines, they are able to meet most eventualities without demanding assistance from without, no more are they afraid of the larger new works that from time to time are necessary for enlargements or radical alterations in old-fashioned parts.

For the slumming of the enormous quantities of clay used here there are extraordinary demands for water. This is absolutely

FIG. 5—NORTHERN LIMESTONE QUARRY.

necessary, when the clay is to be properly washed out and liberated from all foreign matter. From earlier papers it will be remembered how many and various difficulties may be heaped together in that regard, and that here at great costs are established long subterranean conduits connected with pumps, while at another place has been built one or several reservoirs that must be filled at the most favorable time of the year. Failing or insufficient supply of water is to such yards the same as stoppage of the whole or part of the work. All this is quite the contrary at "Frederiksholm," here water sometimes is in superabundance, and measures as the above named have never been needed. This is due to the very low situation of the yard. On one side is the sea above the level of which it is only raised 4 to 8 ft., on the other side it borders on a not insignificant slope of an elevated plateau. On one side the water from the sea is oozing in through sand-veins, cracks and chinks in the long massive dammings shielding the clay-pits, whose bottom is deep below the sea, and from the other side the surplus of every downpour is making its way into all lower parts, among others into the largest and deepest lime-quarry. Efforts are therefore directed on leading away this abundance that is not wanted, and it is pumped out in the sea. During the dry season it is all right, but in rainy times and in autumn with the inclement wet weather the pumping must be kept up night and day to render the work possible. Of course there is a limit that cannot be exceeded; when the water is running in in the same measure as it is poured out, the place must be left and a new field must be opened on either side. For each inch we are digging or grubbing down, the treasure we lift is getting more expensive, and it is therefore clever design to stop while the play is good, especially so in the lime quarries that are the deepest. Here the water determines how far we may go. The extent and contents of the area, however, is a more than sufficient remedy for this, and for long times to come it will yield a compensation for what must be given up successively as impervious.

This grand and many-sided establishment occupies in summer 500, in winter 300 laborers, men only. The winter force is the proper regular staff, mostly married men who here have found a lasting and sure livelihood, and who with their families are living in the neighboring houses or in the nearest district of the metropolis. Functionaries, a few mechanics from the repairing-division, some burners and engine-minders have fixed dwellings on the factory in the properties destined for this. For the use of that part of the men who meet in spring and leave when the campaign is over, and among whom are a number of Swedish laborers, the yard has built a special building practically arranged for this use with common sleeping and sitting rooms. A sutler's store provides all material necessities at exceedingly cheap prices. Of humane measures promoting the welfare of the numerous laborers we may cite a sick and mortuary club which secures the attention of a physician and in some cases a money relief. The means are brought forth partly by a slight weekly contribution of the members and partly by subsidy from the factory. This relief association has in the run of the years been of great use and blessing to the poor men who have been tried by illness and death; up to this day it has paid upwards of $32,000.

The produce of the yard has won a general reputation, and the sale to the metropolis is considerably facilitated through the possibility of supplying according to the demand and room on the place

FIG. 6—FREDERIKSHOLMS PRODUCTS AT STOCKHOLM EXPOSITION.

for building. The yard is able to be the first at the market, and at the exhibitions in the Scandinavian countries in 1888, 1896 and 1897 (Fig. 6) its product has been favored by a flattering attention and was everywhere rewarded by gold medal. Not only in Copenhagen but also round about in the country are to be found many public and private buildings, the fronts and decorations of which have come from this yard. A constantly increasing number of customers

is the testimony of the practical consumer, that the factory in every regard to trying to keep up its good reputation as one of the best in Scandinavia. The hope and wish that the future for this undertaking may be equal to the past is not only shared by those who see an economical profit in it, but also—and not least—by the many to whom "Brickmaking in the Scandinavian Countries" is a question of life and livelihood. Mr. Vilhelm Kohler, who from the first beginning and up till this day has given the factory his best powers, administered and led it in great things and small, will also as far as pre-eminent ability and understanding goes, for the future secure its leading position. Mr. Kohler is uncommonly esteemed on account of his rich gifts, technical experience, human qualities and indefatigable energy. It is therefore quite natural that for years he has been elected to a great many public and private trusts.

The Largest Brick Exhibit in the World.

While in St. Louis interviewing the World's Fair authorities it was our special privilege to pay a flying visit to the headquarters of the Hydraulic Press Brick Co. This company has very fine offices on the 12th floor of the Union Trust Building, in St. Louis. One of the most striking features to the visitor is the magnificence of the brick exhibit which adorns the walls of several rooms. We reproduce here an illustration showing some of the departments of this exhibit. The company has 14 branch plants, all of whose names are well known throughout the country —the American Hydraulic Pressed Brick Co., Union Press Brick Works, the Illinois Hydraulic Press Brick Co., of St. Louis, Mo.; Cleveland Hydraulic Press Brick Co., Cleveland; the Chicago Hydraulic Pressed Brick Co.; Eastern Hydraulic Press Brick Co., Philadelphia; Findlay Hydraulic Press Brick Co., Findlay and Toledo, O.; the Kansas City Hydraulic Press Brick Co., Kansas City; the Menomonie Hydraulic Press Brick Co., Minneapolis, Minn; the New York Hydraulic Press Brick Co., Rochester, N. Y.; Omaha Hydraulic Press Brick Co., Omaha, Neb.; Washington Hydraulic Press Brick Co., Washington, D. C.; the Kaw Hydraulic Press Brick Co., Kansas City, Kan., and the Kelley Brick & Tile Co., Kelley, West Superior, Wis. The products of all these companies have a separate place in the brick exhibit rooms, each column, as shown in the illustration, being built up of the products of one branch, and every column is surmounted by the name of the company to which it belongs. Considerable care was required in the arrangement of this work so as to obtain the greatest harmony of color, and it took several trials to get the best results. There are over 8,000 bricks in the panels alone, of all shades and shapes. There are rooms exclusively for the red molded and colored molded brick.

Of equal interest are the two tables which are seen down the center of the aisle. The first in order on entering the building is what is called the "Architects' Table." This table is especially reserved for architects' use, and any architect who wishes to draw plans and estimate for the use of brick in any building work he may be engaged in may easily ascertain all he desires. A reference to the illustrated catalog of the company will give him the shape, size, color and number of the brick; he can then go to the panel or the room containing the brick in question and determine exactly how suitable it would be for his purpose. A complete set of instruments is kept on hand for his free use and this table and its instruments are constantly used by architects of every grade of importance. Old or young, novice or professional, all alike receive the same courtesy and attention from the officials of the company. A complete line of mortar powders is also kept, and while we were there an architect was busily engaged in mixing several colors in order to get the shade which corresponded best with the brick he intended to use.

The next table is a library table and is covered with bound volumes and files of every paper which is likely to be of interest to the architect. We are glad to say that "Brick" is not neglected in this instance. This table is also for the free access of every inquirer, and the existence of such facilities should be a matter of intense pride to all the clayworkers of St. Louis.

Visitors from every part of the world have been to this office and have counted their visit as one of the most important object lessons in all of their traveling.

We notice also that the bricks that are intended to be sent for samples are all doubly boxed, so that the inner box fits tightly to the brick, and the architect, upon receipt of the package, has only to take the inner box out and remove the cover to perceive the color and shape of the brick without handling the brick itself. It is the attention to small details of this description which lends dignity to our profession.

E. C. Sterling is the president of the company, H. W. Elliott, vice-president, secretary and treasurer, and F. H. Dukes, assistant secretary. We were entertained during our visit by Mr. C. M. Fitzhugh, formerly representing the company iin Chicago, and who, notwithstanding all the attractions which St. Louisans claim for their city, still retains the warmest spot of his heart for Chicago.

THE LARGEST BRICK EXHIBIT IN THE WORLD, ST. LOUIS, MO.

A Synoptical Review of Trade Publications.

One of the most important parts of the equipment of the business man today is a compact, complete library of the publications devoted to the trade in which he is engaged. The older methods of "rule o' thumb" are being abandoned and it is recognized that there are definite bases of operation upon which there can be no difference of opinion. Second to the trade journal which keeps the manufacturer abreast of the latest news about his particular occupation come the books issued on the various subjects which it embraces. In order to facilitate the compilation by our readers of a library of this description, we give here a short synoptical review of the several books which are deemed helpful to clay workers.

HOW TO RUN ENGINES AND BOILERS. By Egbert Pomeroy Watson. [Published by Spon & Chamberlain, 12 Cortlandt St., New York. Price, $1.00.] This work contains much practical instruction for young engineers and steam users. It deals first with the cleaning of the boiler and the renewal of the scale, and also with the use of scale preventers. The practice of putting crude oil or any other kind of grease on a steam boiler for the elimination of scale is deprecated. An interesting description of the slide-valve throttling engine covers several chapters, every part being taken in detail and its relation to other parts being thoroughly explained. A special chapter has been added on water tube boilers.

This book is not intended to be exhaustive in any way but deals with each subject in a clear working English, which will be of great assistance to those who have not time to take up a more extensive and detailed study of the subjects involved.

A HAND BOOK OF ENGINEERING LABORATORY PRACTICE. By Richard Addison Smart, M. E. [Published by John Wiley & Sons, New York. Price, $2.50.] This volume is intended primarily to be a manual for the use of students in the routine of experimental work in steam engines, strength of materials and hydraulics. Concise directions are given for the conducting of the various tests and experiments necessary to enable the student to take charge of and conduct the particular work assigned to him as intelligently and with as little delay as possible. Some attention is given to the elementary measurements of time, speed, liquids, gases, pressure, temperature and power.

The machines for testing of materials are illustrated and are divided generally into two classes, the first, bringing into play a power system by which stress is applied to the specimen, and the second, a weighing system by which the stress applied is measured. Specific directions are given for the performance and recording of these various tests. The last half of the book is occupied with steam boiler testing and a detailed description of the steam engine is incorporated. The appendix contains a valuable series of tables, among which may be mentioned chiefly those of "Circumferences and Areas of Circles" and "The Properties of Saturated Steam."

CLAY GLAZES AND ENAMELS. By Henry R. Griffin, C. E. [Published by T. A. Randall & Co., Indianapolis, Ind. Price, $5.00.]

This is a treatise on glazing and enameling brick, terra cotta and pottery, and includes receipts and formulas for all the principal colors now in use and full instructions for their preparations and application. The growing demand for enameled goods is a sufficient explanation of the use of such a book to clayworkers. The opening pages are historical but the business matter of the book is soon introduced, treating first of the selection of the clay and mixtures, their proportions, and of re-pressing the product. Slipping, glazing and enameling occupy a separate chapter and the various components of these glazes are dealt with one by one in a simple way. Many valuable receipts are introduced in the succeeding pages with directions where required, as to the methods of firing. The final chapter treats of the subject which is of peculiar interest to brickmakers, namely: "Crazing: Its Cause and Prevention."

PRACTICAL FARM DRAINAGE AND THE MANUFACTURE OF DRAIN TILE. By C. G. Elliott and J. J. W. Billingsley. [Published by J. J. W. Billingsley, Indianapolis, Ind. Price, $1.00.] This work has been compiled jointly by C. G. Elliott, the present editor of the Drainage Journal, who deals with the practical farm drainage part, and by J. J. W. Billingsley, his predecessor, whose influence in drain tile circles has been felt for years. The various kinds of soil requiring drainage and the relations of the contour of the surface, and the subsoil to be drained are treated effectively and the method of leveling and erecting drains with a description of the various leveling instruments and the method of computing grade and depth follow. Various ditching machines are described, and of considerable interest to the reader will be the estimates of the cost of drainage, the cost of mains and the profits of drainage. Some space is devoted to the improvement of roads by tile drains.

Part two reviews the present status and the future prospects of the tile business, and the nature of the clays required for the satisfactory making of tile is pointed out. Plans of tile factories, of tile machines, and of the various kinds of kilns for the burning of tile are presented and wise advice is given as regards the selection of the outfit required for the intending tile manufacturer. The practical work of pressing, setting, burning, yarding and selling the tile is dealt with in a common sense way. The "Manufacture of Drain Tile" goes practically over the same ground as the part just mentioned, only the descriptions of machinery are more detailed and a considerable portion of the work is devoted to the description of the various tile factories, the last chapter dealing exhaustively with the various kinds of tile-mills and tile machinery on the market. The whole work is well illustrated and we recommend it to tile manufacturers.

BRICKMAKING AND BURNING. By J. W. Crary. [Published by T. A. Randall & Co., Indianapolis, Ind. Price, $2.50.] This work is written by a gentleman of considerable experience in the brickmaking business. It is commendable inasmuch as it differs from the usual works on brickmaking by omitting any reference to the early history of the brickmaking art along the Nile or in ancient Babylon. It plunges right into its subject, treating of the various clays for making brick and the methods of testing them. The theory of burning clay and instructions how to obtain an even settle all over the kiln are given. The supplement of the work contains the setting forth of the necessary qualifications of the amateur brickmaker and the proper way and place to begin work. The clayworker is advised in the choice of brick machines and specifications are given for building and using brick kilns. The work is written in colloquial style and can be easily understood.

BRICKMAKER'S MANUAL. By R. B. Morrison. [Published by T. A. Randall & Co. Price, $3.00.] This work takes the reader over all the initial difficulties of a selection of a site for a brick yard, the choice of machinery, engines and methods of manufacture. The various operations at the clay bank are described and the most economical plans for the convenient and relative location of kilns, dry houses and machine rooms are designated. A valuable contribution is the part which is devoted to the calculation of the percentage of waste in manufacture and a comparison of production and expenditure. Another subject of especial interest at the present moment is that of driers and their construction which is dealt with in detail. Methods of setting brick, closing the kilns, burning and some pungent remarks on firing and firemen cover four chapters.

The various fuels used in brick burning are compared and the work concludes with an interesting chapter on firebrick and paving brick, and also a description of the successful introduction of the street pavement in America and its rapid gain in public favor.

POTTERY AND PORCELAIN OF THE UNITED STATES. By Edwin Atlee Barber, A. M., Ph. D. [Published by G. P. Putnam's Sons, 27 W. 23d St., New York. Price, $3.50.] The second edition of this work has just been placed on the market and is being received with the same favor accorded to the first. Some people would believe that the pottery industry of the United States is too young to have any history of general interest, but their minds would be speedily disabused of this idea by a perusal of the work under consideration. Although it does not pretend to be a history of every pottery established since the landing of Christopher Columbus, yet it illustrates in an interesting way the gradual increase of the pottery and porcelain industries in our country. The work is copiously illustrated by 277 illustrations and contains 540 pages. The first part is devoted to a description of aboriginal pottery followed by a talk on the early brick and tile making and pottery from the 16th to the 18th centuries. This is followed by the history of the industry between the years of 1825 to 1858, and the pottery industries of East Liverpool and Cincinnati, O., and Trenton, N. J., are dealt with separately and in detail. The various products of these companies are illustrated in a choice manner and the marks and monograms which distinguish the various wares are also shown. The supplement contains additional historical facts and also a description of the marvelous development of the pottery industry in the United States since 1893. Possibly no more valuable contribution to American clayworking literature than this has been placed before us.

THE STORY OF THE POTTER. By C. F. Binns.—Issued by A. Wessels Co., 7-9 West 18th St., New York. Price 75 cents. This little work is a popular account of the rise and progress of the manufacture of pottery and porcelain in all parts of the world, with some description of modern practical working. Earlier chapters deal in a fascinating manner with the story of pottery in oriental lands. The Japanese and Chinese products are well illustrated and the advance of the art in Europe during the Renaissance period is carefully traced. Of especial interest is the description of the fine work in France and England, the latter portion of the work containing a concise account of the present methods of manufacture and decoration. While in no way pretending to be a hand book for the trade, the perusal of this work is very refreshing and offers an easy source of reference for the principal memorable dates in the history of clayworking.

The American Blower Co.

The beginning of what is now the American Blower Co. dates back to something over 20 years ago when the Huyett & Smith Manufacturing Co. began business in Detroit, Mich. The factory was a two-story building about 60 ft. square. At first the company confined itself to pressure blowers, exhaust fans and ventilating fans, designed for lumber dry kilns; the application of similar apparatus for brick driers was soon discovered as presenting a much larger field, and later the company entered actively into the business of applying the fan or blower system of ventilation to buildings of all kinds where people congregate in large numbers. The company was reorganized in 1895 and the name changed to the present one; the business has developed so rapidly that the company now has one of the most prominent industries in Detroit.

No brick manufacturer has a complete plant without a dryer. For a number of years the American Blower Co. confined itself to a steam dryer, which was very successful, and many of which are in use throughout this country and Europe; but of late years, the "waste heat" system has been brought to such perfection by this company that it has, to a great extent, been pushed to the exclusion of the other type. Further reference to this subject will be found in another issue.

Much of the company's product is shipped abroad and one of the most important branch offices is located in London, England, where a corps of competent engineers and salesmen is employed, handling the business throughout Europe. The mere fact that these goods can be sold at such a distance, at necessarily a higher price than that for which they can be manufactured and sold on the other side, is a tribute to their merit.

Extensive additions have been made to the plant and equipment during the past year; where previously two departments had

WORKS OF AMERICAN BLOWER CO.

ample room in one building, it has been found necessary to erect separate buildings for each department and enlarge the power plant and machine tool equipment. The plant is today the model one of its kind, and a glance at the accompanying illustration will show the proportions to which it has grown from a very small beginning.

Of recent years another branch of manufacture has opened up, and is outstripping some of the older lines in the rapidity of its growth, i. e., mechanical draft. The apparatus for this consists of a blower or exhaust fan to produce draft to do away with the familiar chimney. In this particular line, fans often grow to most astonishing proportions. There is now being built at the works of the company what is believed to be the largest fan ever built in the world, having a wheel 18-ft. in diameter; the housing enclosing this is made of steel plate and steel beams and stands nearly 30 ft. in height. This fan is to be used for forced draft in a boiler plant of 10,000 h. p.

Overpack & Metz, makers of drain tile, brick and hollow blocks, of Portland, Ind., have recently completed the rebuilding of their sheds at a cost of $1,000 and are now in an excellent position to supply customers. The factory has been equipped with improved machinery, including an E. M. Freese mill; it comprises 12,000 sq. ft. of floor space. There are two 18-ft. down draft kilns. Natural gas from the firm's own well is used, the buildings all being piped for it. A Chandler & Taylor boiler rated at 35 h. p. capacity furnishes steam for the plant.

St. Louis Letter.

St. Louis is gratified because of the charter amendments recently adopted. They will stop the annual deficit of a million of dollars in the municipal revenue; will permit the reorganization of the sewer system along modern, scientific and sanitary lines and make it adequate to meet the needs of the whole city; will cheapen street construction, permit the making of cross streets and alleys at a cost which will not be burdensome to the property owners; will enable the streets to be kept well cleaned and properly sprinkled throughout the whole city all the year round; will establish a system of boulevards; will protect and preserve the public ownership of the city waterworks; will increase the demand for labor at steady and profitable wages; will reduce the old excessive penalties attached to special tax bills and enable the property owners to pay for improvements in installments running from three to seven years and carrying only 6 per cent interest until maturity and only 8 per cent thereafter, instead of 10 per cent and 15 per cent, respectively, as heretofore; and will prevent the interest on World's Fair bonds being charged against the city's general revenue, which was insufficient to meet the urgent requirements of the public service.

The changes do not add one cent to taxation except a sufficient amount to pay interest on World's Fair bonds and provide a sinking fund. Nor do they cause any man to be taxed directly or indirectly for improvements to another's property, nor open the way for extravagant reconstruction of streets.

These are the points gained by the passage of the amendments and when the World's Fair is held in 1903, visitors to St. Louis will see a New St. Louis, clean, well paved, beautiful and healthful, in other words, a model American city.

When the result of the election was known, city officials in general and members of the board of public improvements in particular, felt jubilant.

Street Commissioner Varrelman has ever since the passage of the amendments been engaged in preparing plats of districts, the streets in which he proposes to improve with modern pavements. All the streets in the central portion of the city, those running north and south, as well as those running east and west, will be reconstructed. Those already reconstructed will not be included, but the unmade and macadamized highways will be improved with granite, brick or asphalt pavements. It will not be possible, of course, to begin work on these streets at once, for certain forms will have to be complied with, but by next spring everything will be ready, and the work will then be pushed as fast as possible.

The street department has a regular system for estimating the cost of street reconstruction with materials generally used. Approximate cost is computed by an equalized rate per square. The standard rates for cost of reconstruction used by the street department in preparing estimates are: Granite paving, $34 per square; brick, $18 per square; asphalt, $26 per square; telford, $10 to $12 per square, and vitrified block, $22 per square.

Durability of the materials is another feature of paving, that the street department persistently submits to property owners for their consideration in connection with cost. A material that would be cheap in one section of the city would be expensive in another. A material that would be easily kept clean in one part of the city would not be satisfactory in some other neighborhoods. Wear and tear, cleanliness, noise and character of vicinities enter into the plans of the department for proposed work.

The ordinary life of granite paving is considered to be about 50 years; brick, 10 years; asphalt, 5 years; and vitrified block, 12 to 15 years. Telford streets require repairs nearly every year. Granite paving is deemed necessary for down-town streets and on thoroughfares where thee is much hauling.

Sewer Commissioner Hermann also has elaborate plans for his department. He expects to expend about $1,000,000 in the new joint districts and district sewers, prior to the opening of the World's Fair.

The first sewers to be constructed are those for the districts of the city where the density of population demands better sanitary conditions. The earliest to be constructed will be for the Cabanne district, which will be about ten and a half miles long and costing about $150,000. The section about Tower Grove Park, the completion of the Tower Grove storm sewer, which will cost $120,000, which has been standing idle several years, on account of no appropriation being made for finishing it, and an auxiliary sewer for the better draining of Benton Park district.

By the middle of January it is thought that the contracts can be let.

It is proposed that work be begun in half a dozen places at once thereby having them finished in much quicker time.

Several sewers in the down-town section will also be attended to at the earliest possible moment.

In several populous parts of the city, street construction will have to wait on sewer building, otherwise new brick and asphalt pavements would have to be torn up within a few weeks after being laid, hence the work of preparing legislation for new sewers is being hastened in preference to that for new streets.

Stret improvement "districts" are not wide areas, subject to a general tax. Each street to be improved is the center of its own district, which extends for half a block on each side. One-fourth of the whole cost of the reconstruction is paid by the property fronting on the street, the "front foot" plan being followed, and the other three-fourths is paid by all the property holders of the "district" on the area plan. Those who have paid one-fourth are included in their due proportions in the list of those who are required to pay the three-fourths.

Joint district sewers are to be paid for equally by all property in the territory which they drain, according to area.

Street railway companies will pay the cost of paving between their rails and for one foot on each side of the rails on all streets where they hold franchises.

All payments for street and sewer reconstruction will be made on the installment plan, in three or seven annual payments.

Not much can be done in the way of improving the public buildings until next fall. The amendments provide that the people must authorize an increase in taxes to raise money for municipal buildings by a two-thirds vote and an election to submit such a proposition cannot be held inside of a year.

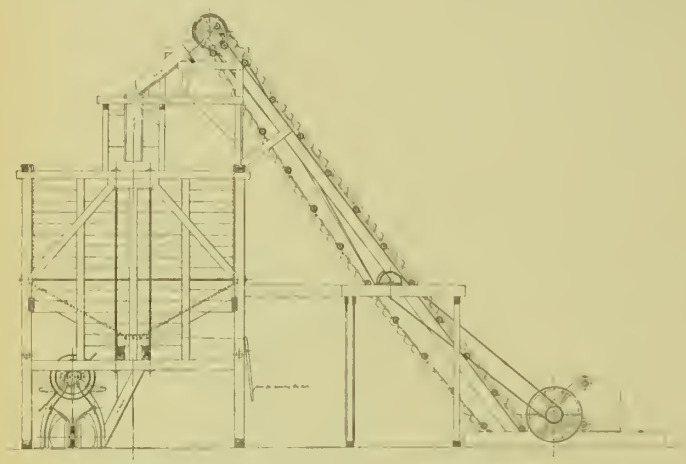
Business generally during the last few weeks has been highly satisfactory, both locally and out of town, with the brick industries. Until the last few days the season has been everything that the brickmakers and the building industries could wish for. The last few days, however, has been bad, for a blizzard has been on in this city, and it has been almost impossible for any work to be done. How long it is going to continue is a doubtful question.

The price of brick remains the same, viz.: Merchantable brick, $7.25; ordinary brick, $7.75; strictly hard, $8.25; red pressed, $17.50; and sidewalk brick and paving brick, $8.50, delivered.

The report of the building commissioner for the month of November shows an increase in the value of building permits issued over the corresponding month last year of $98,963, the total being $759,241, as compared with $560,278 for November, 1900. Permits were issued during the month for the erection of brick buildings at a cost of $760,022; repairs on brick buildings, $65,132; new frame buildings, $19,192; repairs on frame buildings, $4,895. In November, 1900, the amount expended for the erection of new brick buildings was $379,259; new frame buildings, $12,437; repairs on frame buildings, $168,582.

"Champion" Crushing Machinery.

The American Road Machine Co., of Kennett Square, Pa., reports that its trade during the past year has been excellent. The company's "Champion" rock crusher has proved both its usefulness and its economy to brickmakers in breaking rock, shale, fire clay and other hard materials, with the result that the sales of this machine have rapidly increased. It is claimed for this crusher that it is the cheapest to use because it will do the largest amount of work at the least cost for repairs and that it will save its first cost to any brickmaker after it has been in active use but a few months.



CRUSHING PLANT—GOOD ROADS MACHINERY CO.

The accompanying illustration is a reproduction from the working drawing of a complete crushing plant, including crusher, elevator, bin, and dry pans furnished by the American Road Machine Co. to the Phillipsburg Fire Brick Co. of Wigton, Pa.

A specialty is made of installing complete plants of this character, and a catalog of "Champion" crushing and brick making machinery will be furnished free on application to the company.

Pottery Notes.

The Peters & Reed Pottery Co., located at Zanesville, O., and formerly making jardiniers, etc., from clay ground in its rough state, has increased its capital stock from $10,000 to $25,000. It will now wash all its clay in the regular manner and has purchased all necessary machinery. The output of the plant will be considerably increased.

The plant of the Nyenusis Pottery Co., at Muscatine, Ia., was entirely destroyed by fire on November 20th.

The American China Co., at Toronto, O., is very busy and is running full and overtime in every department. Many of the different departments are finding it necessary to work much at night.

The Crown Pottery Co., at Evansville, Ind., has been reorganized with a capital stock of $75,000. The following are the officers: H. V. Bennighof, president; S. P. Gillett, treasurer, and Chas. A. Uhl, secretary.

The Chittenango Pottery Co., at Chittenango, N. Y., has shut down the plant for the present, but it is now proposed to triple the capacity and double the capital stock. The plant contains three kilns.

The Buffalo Pottery, Buffalo, N. Y., has been incorporated with a capital stock of $50,000. One of the principal owners of the stock of the new concern is the Larkin Soap Co., of Buffalo. Mr. L. H. Bowen and W. J. Rea have been engaged to look after the practical end of the business and it is an assured venture. The Larkin people annually give away many thousand dollars worth of ware as premiums, and it is thought that this is one of the reasons for their association with the new pottery.

The Youngstown China Co., of Youngstown, O., has been incorporated with a capital stock of $50,000. The company will erect a plant at once.

The Akron China Co., Akron, O., is considering a proposition to double the capital stock. It is unable to keep up with orders with the present capacity.

The Hanover Pottery Co., of Portland, Me., has been incorporated with a capital stock of $300,000 and the following officers: W. H. Baker, president; W. H. Corn, treasurer, and W. H. Bradley, secretary.

The Rochester (Pa.) Decorating Co. has been incorporated to decorate china, with a capital stock of $10,000.

The Cambridge Art Pottery Co. is working to the full capacity and is considering the erection of additional kilns and enlarging the plant throughout. The pottery has now two kilns.

The Zanesville (O.) Art Pottery Co., whose art pottery at Zanesville recently burned, is now beginning the erection of a new plant. Only the latest machinery will be installed.

The Keystone Pottery, at Trenton, N. J., is rebuilding the kiln sheds which were lately destroyed by fire.

Very extensive repairs are being made at the Empire Pottery Works, at Trenton, N. J. The plant will be in good shape early this year.

It is said the case of the new Barberton pottery, to be erected at Akron, O., is somewhat the same, as many of the stockholders of this new concern are also very heavy stockholders in the Great Western Cereal Co., which also give away annually a good many thousand dollars worth of pottery products.

A. M. Well, of Evansville, Ind., has closed a deal whereby he will have control of the Peoria Pottery, located at Peoria, Ill. It is said that Mr. Well has many good people back of him and that the pottery will start on a larger and grander style than ever before. This pottery has not been a very great success in the past few years; why, no one seems to definitely know.

Owing to many differences which have arisen, the Egyptian Pottery Co., of Trenton, N. J., has surrendered its charter. This will also close the oil-cloth factory operated by the same firm. The reason for the disbandment is not correctly known, but is said to be the result of many disturbances and disagreements between the stockholders and directors.

Salineville, O., is to have a new pottery. The Salineville Land Co., and it is said some potterymen from East Liverpool, O., are interested. Mr. W. H. Deidrick, of East Liverpool, is said to be the heaviest stockholder of the out-of-town parties. The new company is to receive a bonus of $25,000 from the land company as an inducement to locate the new plant on the latter's land.

A new clay company has been incorporated at Aiken, S. C., under the name of the Aiken Kaolin Co. The new concern will mine and refine clay for use in potteries and tile factories.

The Kirkman Art Tile Works, at Akron, O., was sold last month for $30,000. There was spirited bidding between four representatives of stockholders, bondholders and creditors, and the last bid was made by Mr. Frank H. Atterholdt, representing the bondholders. It is not definitely known what will be done with the property, but the old company will in all probability be reorganized and a new plant built and this one remodeled. The property consists of seven acres of ground, the plant and several kilns and the valuable machinery in the plant and patents on the articles

the old company manufactured. The plant was burned to the ground about eight years ago.

The Royal Sewer Pipe Works, at Midvale, O., three miles north of Akron, which is at present one of the largest in the country, is to have its capacity doubled. About $150,000 will be spent in improvements. Work has already been started.

It is said that Mr. H. B. Camp will soon dispose of his holdings in the Federal Clay Manufacturing Co., of Akron. Mr. Camp will not, however, necessarily retire from the clay manufacturing field, as he is president of the new Barberton Pottery. to be erected shortly at Akron. Mr. Camp has stated that he had given an option on his holdings in the Federal to stockholders already in the company. About two months ago the properties of the Camp Clay Mfg. Co. were consolidated with those of the R. C. Penfield Co. under the name of the Federal Clay Mfg. Co.

The Brian Pottery Co., at Trenton, N. J., is adding to its bath tubs a line of general sanitary pottery. A large addition has been erected for the making of the new goods and the first kiln, which was drawn last week, gave very satisfactory results.

The pottery located in the city of Mexico has suspended operations owing to lack of capital. Although several potteries have been tried in Mexico they have not, as a rule, been very successful.

Banqueting seems to have become a fad among the potters of the United States. The banquet given by the Potters' Exchange at East Liverpool, O., on December 4th, was an event long to be remembered by the potters of that vicinity.

The Brian Pottery Co., of Trenton, N. J., also celebrated in a similar manner. The company a few years ago erected a small plant which was devoted to the manufacture of bath tubs. An addition, before mentioned, was built recently for the manufacture of general sanitary pottery.

Another pottery affair of the season was held at Pittsburg, Pa., December 11th. It was the 23d annual convention of the United States Potters' Association. On the first day of the convention a great address was made to the members of the association by Pres. Chas. Howell Cook, of the Cook Pottery Co., Trenton, N. J. On the evening of the 11th the banquet was held, which was a great success. About 100 guests were present.

Pacific Coast Letter.

According to all appearances the brick trade is on the eve of a genuine revival in San Francisco. In all parts of the business section of the city old buildings are being demolished to make room for new modern brick blocks. On California St. a new building is to be put up by the Mercantile Trust Co. The Merchants' Exchange of San Francisco, is also preparing to put up a fine fireproof structure in the same locality. On Sutter St. a block of old buildings is now being torn down, preparatory to the erection of a fine store and office building. In the neighborhood of Union Sq., M. H. de Young has already let contracts for the erection of a seven-story fireprof building; a new Heine building is to be crected and the Crocker Estate is preparing to build one of the finest hotels in the West. On Market St. the Mutual Savings Bank Building is already under way, and in the manufacturing district south of Market St. several large buildings are to be put up.

At a meeting of the Board of Public Works of Stockton, Cal., Harry T. Compton was selected as engineer for the laying of the new sewers in that city.

A proposal to pass a new ordinance in regard to the gas grates used in this city has stirred up a great deal of newspaper talk about the workings of the "terra cotta ring." Under the existing ordinance, the fire place and vent for the fumes from gas burners can be put in at a very small cost. Under the ordinance which is now introduced, it is claimed that the cost will amount to four or five times as much. The real merits of the case are hard to get at, but the new proposal has aroused so much talk that it seems likely to fail of passage.

The school board of Los Angeles, Cal., has made an estimate of the needs of the school department in the matter of new buildings. Their estimates amount to more than $327,000 for buildings alone. This, of course, does not mean that this amount will be expended at once, but brick manufacturers believe that it indicates the steady expenditure of considerable amounts for new school buildings.

Street Commissioner Lilienthal, of Sponkane, Wash., opened bids on December 4th for the construction of a large amount of brick walks in that city. The bids of the different contractors were as follows: Blair & Foster, $1.05 per yd.; Byrns & Belfre, $1 per yd.; L. C. Mondt, $1.35 per yd.; John Huetter, 75 cents per yd.; and August Ilse, 95 cents per yd. These prices do not include the excavating, rock cutting and curbing which has to be done.

A representative of the Idaho Brick & Lime Co., with headquarters at Spokane, Wash., has been looking up clay deposits in the vicinity of Coeur d'Alene, Idaho, and is reported to have found a suitable location for a brick plant in that locality. This company has contracts for the delivery of five million bricks in Spokane, next year.

The Imperial Land Co, of Imperial, Cal., is preparing to establish a brick yard on its property at that place. John Miller has been employed as foreman. The new brick yards will have a capacity of 8,000 brick per day, at first, but will before long have new machinery added which will bring the capacity to 12,000 bricks daily.

Simmons Bros. of Pasadena, Cal., are preparing to double the capacity of their brick yard at that place.

It is generally understood that Craycroft Bros., of Fresno, Cal., are arranging to open a large brick yard near Point Richmond, Cal. This firm has a contract to supply two and a half million brick to the Standard Oil Co. for its new refinery at Point Richmond.

The Arizona Clay Manufacturing Co.'s plant at Benson Ariz., began operations on December 1st. The first run was merely a test of the new machinery, but everything is reported to have gone off satisfactorily. The manufacturing of pressed brick for the market began last week.

Assistant City Attorney Jeffries, of Seattle, Wash., who has direct supervision of the paving in various districts of that city, states that plenty of paving brick are now to be had and that in all probability all the contracts will be completed by January 1st. The contractors have been delayed by their inability to get paving brick delivered.

W. C. Neumiller has been appointed assistant manager of the Stockton Brick & Pottery Co. Mr. Neumiller will fill the place made vacant by the transfer of George S. Wheatland to Oakland, Cal.

At a meeting of the mayor and common council of San Jose, held a few weeks ago, bids were opened for the construction of the proposed Carnegie Library Building. All the bids for the work were in excess of the estimates of the architect and were rejected by the council. The only bid for the entire work was that of W. T. Veitch & Bros., of Oakland, Cal., who put in a bid of $56,550. F. A. Curtis, of San Jose, offered to do the brick work for $27,877.60. Mangrum & Otter, of San Francisco, offered to furnish the tiling for $978. Excepting the bid of Veitch & Bros., there were no bids for fireproofing.

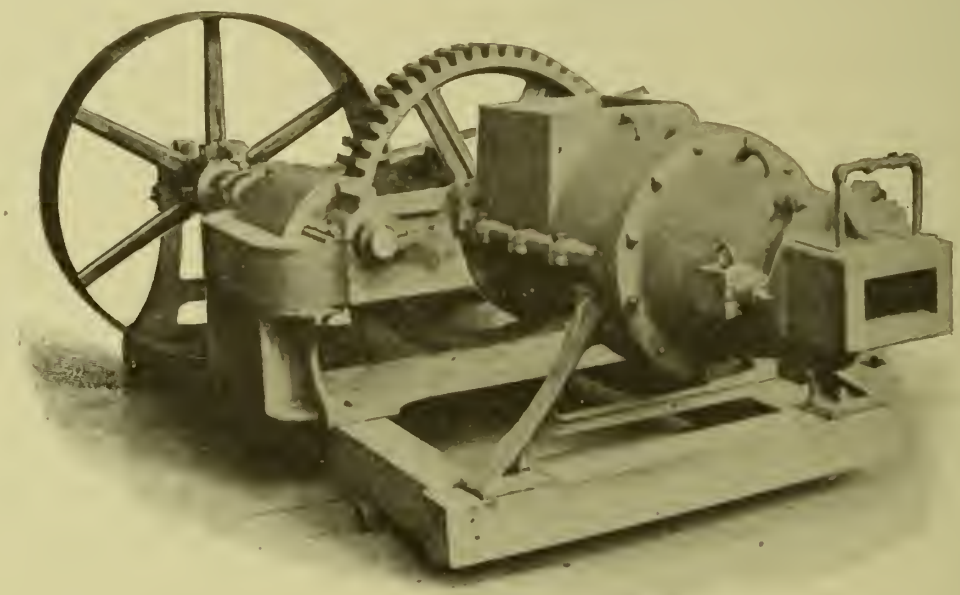
The McNear brick yard, near Pt. San Pedro, Marin Co., Cal., is now closed down. During the winter the kiln will be greatly enlarged and improved previous to reopening the yard.

A report from Mt. Vernon, Wash., states that a brick yard is now being opened at Alger, near the former town.

Henry Martin Brick Machine Manufacturing Co.

Among the foremost brick machinery makers may well be placed the Henry Martin Brick Machine Manufacturing Co., of Lancaster, Pa., which enjoys a most enviable reputation throughout the entire world. Though the "Martin" soft-mud machines have been the means of building up trade for hundreds of brickmakers in different parts of the country, the company does not confine itself to machines for this process, and is prepared to equip plants complete for either the dry press or wire cut process.

Our illustration shows an improved auger machine recently placed on the market. This embodies valuable features which will be properly appreciated by brickmakers. The company carries a full line of barrows, trucks, brick molds, kiln castings and general yard supplies and is at all times prepared to make prompt shipments. The company's motto is: "We furnish everything a brickmaker needs." Copies of the latest catalog may be had on application.



THE MARTIN IMPROVED AUGER MACHINE.

Dunn Continuous Kiln.

Perhaps no one subject is attracting more attention among brickmakers at this time than that of continuous kilns, and our readers will all be interested in the Dunn continuous kiln which has for four years been in operation in the yard of H. C. Dunn, at Erie, Pa., where it is now burning bricks of even color throughout the kiln at the rate of 10,000 bricks per ton of coal. I. M. Justice, a practical brickyard constructing engineer, was attracted to this kiln by the high grade of the product, and its great economy in fuel, and believing that it was designed on true scientific and mechanical principles and had points for which the progressive brickmaker is seeking, Mr. Justice manifested his faith by securing the exclusive control of its sale in the United States.

As mentioned, the kiln has been in operation for four years in Mr. Dunn's yard, and by reason of the success there attained led to orders from other parts of the country. Dunn kilns have been used by the Ottumwa Brick & Construction Co., Ottumwa, Ia., for two years and by the Marquis Limestone & Clay Co., New Castle, Pa., for one year, and others are now building at Nashville, Tenn., and Cleveland, O.

Heretofore little effort has been made to acquaint the trade generally with the merits of this kiln, but Mr. Justice is now issuing an illustrated catalog containing full descriptions of the construction and process of operation, which will be mailed to those interested upon applying to him at Erie, Pa.

The claims made for the kiln are: It is constructed on scientific principles. Its draft and combustion are perfect. It is economical and natural in its operation. All firing is done from the top. There are no underground flues. Any brick burner can handle it. It will burn all hard brick. Its cost for construction is about one-half less than square down draft kilns, and one-third more than up draft kilns of the same daily capacity.

D. F. Morey, manager of the Ottumwa plant, concerning the operation, says: "The kiln is a big success right from the start, and every day we use it our faces get broader and broader, and everybody around the plant, from myself down to the mule driver and water-boy, is feeling good. We built our kiln as good as it could be built of the brick we make ourselves. For the cross walls, crown and lining, we used our best selected paving brick which will stand a terrible heat, being made from a kind of Boston fireclay. I built the stack 20 ft. higher than was necessary, just to be on the safe side, and we have all kinds of draft. We have never been able to have the damper all the way open yet."

Over 1,000,000 brick have been turned out this season at the new steam brick plant of M. J. Olewiler at Red Lion, Pa.

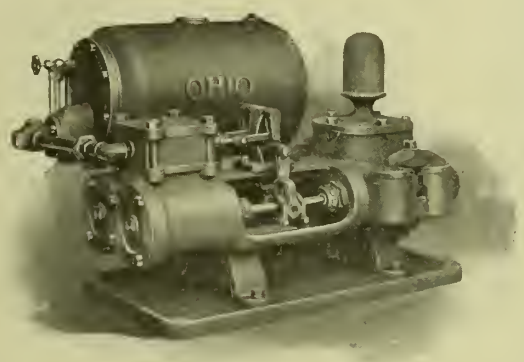
The Clearfield (Pa.) Firebrick Co. has been awarded the contract for furnishing 10,000,000 brick for the erection of the New York Central shops at Oak Grove. The company proposes to build an additional plant at Jersey Shore.

The Agricultural & Economic Survey of North Dakota, located at Fargo, N. D., announces that practical tests will be made of all samples of North Dakota clays sent in for the purpose in order that the extent and value of the deposits in that state may be determined. The chemical analyses and practical tests which have thus far been made show conclusively that North Dakota is rich in clays suitable for the manufacture of high grade firebrick, building brick and pottery. C. M. Nall, director, may be addressed at Fargo.

Automatic Feed Pump and Receiver.

The accompanying illustration shows the "Ohio" automatic feed pump and receiver for collecting the condension from heating systems and automatically returning it to the boiler while the water is at a high temperature. In addition to the economy of fuel secured by feeding the water to the boiler hot, to secure which a special heater would otherwise be required, this arrangement provides pure water for the feed.

The apparatus is designed to be unaffected by variations in the steam pressure and absolutely positive and automatic in operation, keeping the piping system dry and returning the water to the boiler in a steady stream. It is equally well adapted for



AUTOMATIC FEED PUMP AND RECEIVER.

regulating the circulation of brine in refrigerating plants and may be successfully used in connection with beer cooling apparatus and elsewhere for automatic circulation regulation.

The method of operation will be apparent from the following description: As the water flows into the receiver, it raises a ball float therein, which opens the valve controlling the supply of steam for operating the pump. As the water is removed from the receiver, the float lowers, thus closing the valve and gradually stopping the pump. The pump operates only as the water of condensation enters the receiver. The apparatus is made by the Ohio Steam Pump Co., 19th and Walnut Sts., Canton, O., which will be pleased to furnish further information to interested parties

A Good Year for Potts & Co.

C. & A. Potts & Co., of Indianapolis, have had a most prosperous year, the demand for their "All Iron" horizontal stock brick machines, disintegrators and mold sanders having been greater than ever before. Last spring the firm had to refuse several orders, not being able to furnish the machinery, and during the season they enlarged the shops, doubling the capacity. Even with this increased capacity they have had to run the shops extra time. It was expected that during the months of November and December business would fall off and enable them to stock up for the coming year, but it was found impossible to make any stock whatever. In December the firm shipped five complete brick plants, one going to Maine, and one to California (the plant shipped to California is the fifth plant to one company, an indication that this machinery gives satisfaction). A two-machine plant for the Indiana Brick Co., of Anderson, Ind., was placed on the ground in December.

C. & A. Potts & Co. write us as follows concerning their business: "We spend less money for traveling salesmen than any other manufacturer. We get a full share of the business, most of which comes to us without expense of any kind. We pay no commissions whatever and this enables us to put more money into the construction of our machinery and still meet the prices of competitors. In the construction of the horizontal stock brick machine, we plane every joint, there not being any two pieces of casting bolted together, with rough surfaces; bolt-holes are drilled from the solid and the bolts fit tight. This all costs money, and a few years ago was laughed at as an unnecessary expense, but today the brickmaker realizes that if he wants to make 40 M. brick or over per day his machine must be well built, and that he can not make this number of brick if he has to stop three or four times a day to tighten up parts of his machine. The users of our machines find it easy to keep their help, as there are never any annoying stops or delays during the day. One machine in use at Toledo shows a record of 49 M. brick every day for the past season. We never make unreasonable claims for our machine, such as ability to work the clay stiff enough to repress the brick as they come from the machine; this cannot be done but to the inexperienced it sounds nice. By giving our customers the advantage of all commission, and salaries of expensive salesmen, we have been able to furnish well built machinery which does all we have claimed for it, and to build up a reputation of which we are justly proud. The demand for our disintegrators holds up well, and we have sold 72 machines during the past year."

The Age of Pottery Told by a Magnet.

It is a well known fact that vessels traveling east and west or north and south for any considerable length of time become magnetized in that direction so that should they alter their course the compass would be appreciably affected, the pull of the needle being decidedly towards the old direction. A French scientist with the harmonious name of Folghorafter has gone a step further and claims that magnetism has a definite place in the consideration of the antiquity of pottery. The magnetic needle varies radically with the different changes of cycles of time in this direction, and we are able to determine definitely how a needle pointed 10,000 years ago or how it will point 10,000 years hence. Our French scientist maintains that as most clay contains iron and that iron is magnetic in the direction of the prevailing force, that when the clay is fired this fixes the direction of the magnetism at that instant. By means of the dip or "inclination" method the various ages of vases fired at that time have been ascertaind, and although the experiments as yet have not been of sufficient variety and extent to justify the formulation of a table, the application of this method to vases of the Roman and Etruscan periods so far have yielded results which confirm the theory and are gratifying to its promulgator.

The Riverside (Cal.) Brick Co. has resumed operations after a few days shutdown while repairs were effected. Several kilns of brick will be burnt at this plant before the season closes.

A. F. Smith & Co., of New Brighton, Pa., have sold the entire stock, business, good will, leases and contracts of the firm to the A. F. Smith Co., a corporation duly organized under the laws of Pennsylvania, which will continue the business. All accounts due the old firm will be collected by the new corporation which will pay all liabilities. The A. F. Smith Co., as a corporation, enters the field of business fully equipped in every way to largely increase the business heretofore done by the old firm. It has ample capital for all necessary requirements, its officers are business men of experience, and with its greater advantages a largely increased business is anticipated. The company is engaged in the manufacture of fire brick and grate tile, and makes all kinds of shapes.

SOME OF THE BEAUTIFUL STRUCTURES INTENDED FOR THE WORLD'S FAIR, ST. LOUIS, MO.

The Louisiana Purchase Exposition, St. Louis, 1903.

All preparation for the World's Fair to be held in St. Louis in 1903 is being hurried as much as possible. The ground was broken on December 20th and although the extreme cold entailed the postponement of the intended imposing procession, yet there were several thousand people present at the ceremony who arrived in all manner of conveyances, sleighs, automobiles and carriages. The ground was broken with an old wooden shovel found in the lead region of San Francois County, Mo., made by a Frenchman more than 100 years ago.

It is expected that more than $50,000,000 will be spent on the exposition before it is opened to the public. Congress, the city of St. Louis and private subscription have amassed $15,000,000 and $10,000,000 have been borrowed on the gate receipts. The states and territories of the country will expend over $10,000,000 and a similar sum will be the outlay of foreign countries, and it is expected that individual exhibitors will make an outlay of over $5,000,000.

Transportation facilities will excell any previously contemplated. A belt line will be built connecting all trains with the grand entrance of the exposition grounds and it is expected that there will be means of transportation within the grounds themselves. The headquarters of the Louisiana Purchase Exposition are in the Laclede Building, St. Louis.

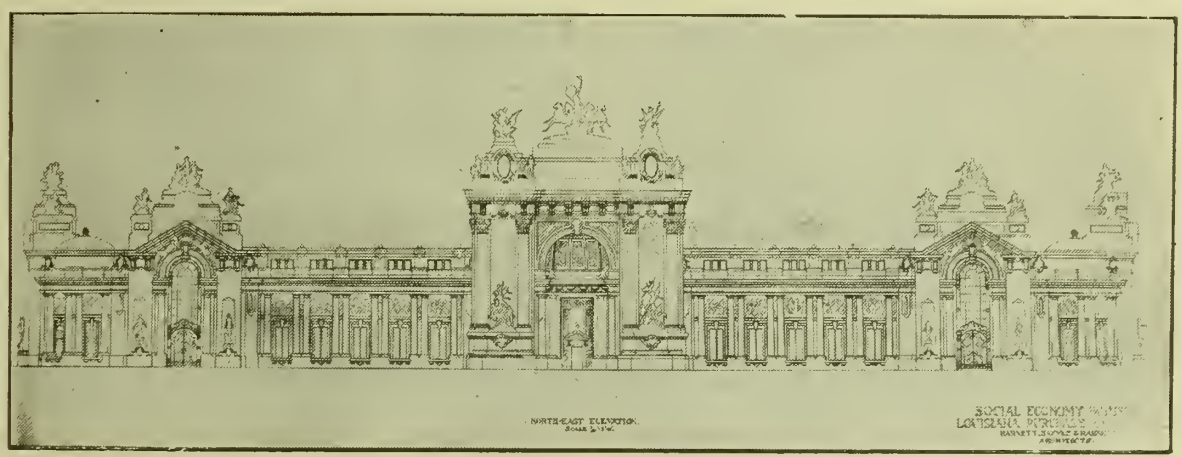
When we approach the subject of the intended structural grandeur we have opened a field for contemplation and admiration. The Mines and Metallurgy Building will be situated close to the main entrance with a facade of 1,250 ft. on the north and 525 ft. on the east, giving an exhibition space of 656,250 ft. on the ground floor. The building is of a columnated design with free treatment of the Ionic order. There will be a central tower 400 ft. high and flanking towers 200 ft. in height. These towers will offer ample space for electrical illumination and display. In the interior there will be a magnificent corridor through the center from north to south while a gallery constructed specially with a view of architectural beauty will nearly double the exhibit space in the building. Messrs. Van Brunt and Howe are the architects who designed this beautiful structure.

The Educational Building will form part of the east wing of the fan-like general ground plan. The outside diameters are 525x750 ft. and the interior is divided into eight oblong parts almost equal in area because the general scope of the Committee on Educational Exhibits shows a classification into eight departments. The facade of the Educational Building may be likened to a screen bearing the same relation to this structure as do the colonnades of the adjoining buildings. The base of this screen consists of sculptured panels illustrating in bold relief the progressive stages of civilization in symbolical representation. The background of these sculptured figures is to be of a rough golden-colored glass which will be illuminated at night and show the figures in silhouette. The figures are more than life size. Theo. C. Link, of St. Louis, is the architect of the Educational Building.

The Art Building will be one of the most beautiful buildings on the grounds. It is situated at the apex of the fan, the shape of the arrangement of all the buildings at the exposition. It is arranged in semi-circular form with a central dome and inside the semi-circle from the base of the building begin a series of terraces which descend to the edge of the water of an immense lagoon. From the center and the two ends of the building issue cascades which have as many falls as there are terraces and the lagoon itself is dotted all over with fountains of great power and beauty.

There are to be many other buildings amongst which may be mentioned the Liberal Arts Building, the Electricity Building, Transportation Building, Government Building, Social Economy Building, the Fraternal Building and the Missouri Building. But one of the most important acquisitions from every point of view, financially and architecturally, is the annexation or lease of the Washington University buildings and its adjoining 110 acres. These buildings are nearly all of them completed and are intended for the University, but the Louisiana Purchase Exposition has leased them and in return will build for the exposition, several other prominent buildings such as the library and gynasium which will remain as part of the rental for the buildings. The University Hall will be ready for use as the Administration Building of the exposition company as soon as the electrical and heating apparatus can be installed.

The extent of the grounds available for this fair is some 350 acres more than that of the World's Fair in Chicago; moreover, these grounds have a peculiar advantage over the latter inasmuch as the rolling ground of the site will present a series of scenic pictures. Grades and slopes, hills and valleys, forest and plain will add charm and the numerous canals and lagoons will contribute in no small measure to the delight of the sightseer. There, of course, will be the usual side attractions in shape of a Midway and buildings and structures devoted to specific exhibits. Several points



TRANSPORTATION BUILDING.

commend themselves to our attention at this moment and amongst them is the erection of a sphinx to be modelled line for line upon the Sphinx in Egypt. Not however, as it is at present, half buried in the sand, materially affected by the ravages of time, but as it was when it first stood with immovable countenance before the wondering Egyptians. This statue is intended to be permanent and will contain an extensive exhibit of Egyptian treasures which will remain forever as an adornment of Forest Park.

The second is the great Friede Aerial Globe. The construction of this vast building is about to be begun in a site comprising six acres. Some idea of its enormous proportions may be had from the fact that it will require 14,000 cars to transport the steel, stone and cement to be used in it and the cost of construction will exceed $1,500,000 at least. It will be made entirely of steel 750 ft. in height with a basic circumference of 1,000 ft. and a capacity of 25,000 people. In it will be a coliseum, theater, music hall, palm gardens, illustrated dome and a moving cafe which will afford a gentle continuous motion around its circumference at a point 400 ft. above the earth.

In spite of all rumors as to the necessity of postponement of opening the St. Louis Fair to 1904 or 1905, it is definitely announced by the Louisiana Executive Committee that everything will be ready on time. Things are being taken hold of in an enthusiastic manner and from time to time we hope to be able to record the satisfactory progress of an exposition which it is hoped, will prove the success it is intended to be.

Patent Notes.

We give below a list of the patents and trade marks relating to the brick, tile and allied clay industries granted since our last issue, prepared especially for "Brick" by William F. Hall, patent attorney, Equitable Building, Washington, D. C.:

685,335. Brick Truck, granted Oct. 29, 1901, to Lambert N. Legg, of Calhoun, Ga.

685,410. Apparatus for Veneering Brick, granted Oct. 29, 1901, to Andrew Ramsay, of Savage, Md.

685,536. Maanufacture of Tiles, etc., granted Oct. 29, 1901, to Regenald Stanley, of Nuneaton, Eng.

685,647. Supporting Bar for Tile, granted Oct. 29, 1901, to Leonard Sborigi, of New York City.

685,666. Manufacture of Ceramic Ware, granted Oct. 29, 1901, to George Von Dem Borne, of Bornhofen, Germany.

686,326. Brick Kiln, granted Nov. 12, 1901, to Wm. H. Patton, of Payne, Ohio. Assigned one-half to Wm. H. Knoke, of Belmore, Ohio.

686,407. Brick Kiln, granted Nov. 12, 1901, to Wm. Joyce, of Cambridge, Mass.

686,659. Brick Machine, granted Nov. 12, 1901, to David A. Keizer, of Winnipeg, Canada.

686,370. Brick Molding and Pressing Machine, granted Nov. 12, 1901, to Arthur E. Volkersen, of Hamburg, Germany.

686,333. Process of Making Artificial Stone, granted Nov. 12, 1901, to Paul J. Prior, of Cologne, Germany.

686,656. Machine for Making Tiles, granted Nov. 12, 1901, to Andrew J. Hoban, of St. Paul, Minn. Assigned one-half to John P. Berchem, same place.

687,103. Brick or Combined Brick and Tile, granted Nov. 19, 1901, to David W. Anderson, of Richmond, Va.

687,105. Brick for Making Structures Fire-Proof, granted Nov. 19, 1901, to David W. Anderson, of Richmond, Va.

687,106. Paving Block, granted Nov. 19, 1901, to David W. Anderson, of Richmond, Va.

687,080. Manufacture of Artificial Stone, granted Nov. 19, 1901, Nov. 19, 1901, to Louis A. Garchey, of Paris, France.

687,011. Artificial Stone, granted Nov. 19, to Louis A. Garchey, of Paris, France.

687,080. Manufacturer Artificial Stone, granted Nov. 19, 1901, to Thomas W. Thom, of Wood Green, England.

687,688. Machine for Pressing Plastic Substances, Nov. 26, 1901; Abraham B. Klay, Ottawa, O. Assigned to A. B. Klay Co., same place

687,915. Brick Machine, Dec. 3, 1901; Cyrus Chambers, Overbrook, Pa. Assigned to Chambers Bros. Co., Philadelphia.

688,641. Tile, Dec. 10, 1901; Geo. P. Heinz, Chicago, Ill.

688,562. Means for Indicating Temperature of Kilns, Dec. 10, 1901; Henry Watkins, Burslem, England.

688,736. Machine for Making Non-Slipping Treads, Pavements, etc., Dec. 10, 1901; F. W. Huestis, Newtonville, Mass. Assigned to Universal Safety Tread Co., Jersey City, N. J.

689,015. Metallic Curb, Dec. 17, 1901; John N. Harrison, Ottawa, Kan.

688,129. Manufacture of Refractory Materials for Building or Other Purposes, Dec. 17, 1901; Alfred G. Salamon, London, England. Assigned to British Uralite Co., same place.

689,148. Re-press Brick Machine, Dec. 17, 1901; Joseph Walker, St. Elmo, Va. Assigned to H. P. West, Washington, D. C.

688,851. Metallic Curb, Dec. 17, 1901; John N. Harrison, Ottawa, Kan.

688,981. Brick Truck, Dec. 17, 1901; Hugo Zastrow, of Wittenberg, Germany.

689,651. Brick Cutter, Dec. 24, 1901; Samuel McAdoo, Toronto, Ohio. Assigned to American Clay Manufacturing Company of New Jersey, Pittsburg, Pa.

34,436. Tile, Dec. 10, 1901; Jos. R. Liever, New York City.

34,437. Tile, Dec. 10, 1901; Jos. R. Liever, New York City.

Personal.

Shortly after the holidays Mr. E. M. Pike, of Chenoa, Ill., with his family and a party of friends will leave for Florida to spend the winter. Mr. Pike very much regrets that this trip will prevent him from attending the meetings of the various clayworking associations.

Henry Lewis, president of the Atlanta (Ga.) Tile Co., was injured in a collision between a buggy in which he was driving and an electric car, December 6th. Mr. Lewis was thrown from the vehicle, striking his head against the curb and sustaining two severe cuts, from which, at last reports, he was slowly recovering.

Ambrose J. Cartwright, of East Liverpool, O., will be general manager of the Barberton Pottery Co. upon the completion of its new plant which will probably be about June 1st. Mr. Cartwright has for many years been connected with the Cartwright Pottery and the Union Pottery of East Liverpool. He will remove his family to Barberton, O., in February.

William McCubbin and his brother Rolla McCubbin were callers on "Brick" when in Chicago recently. William McCubbin has an extensive plant at Braymer, Mo., making drain tile, building brick, hollow building blocks and vitrified ironstone paving brick; the season has been a most prosperous one, and the outlook continues good. Rolla McCubbin is a member of the firm of McCubbin Bros., brick manufacturers, Breckenridge, Mo.

The city authorities of Stockton, Cal., are now proceeding with the work of extending the rainfall sewer system in that city. The specifications call for the best quality of pipe.

A Britisher Has an Idea on Brick Machinery.

Rumor says that at Niagara, by means of a trickle of falling water and a yard or two of electric wire, an energetic business man has set in motion some machinery that grinds coffee, sweeps chimneys, settles law suit and shaves chins in a town situated several miles from the trickle or motive power. If Niagara can thus be harnessed, why should not earthquakes, tornadoes, superfluous sunshine and other energy-wasting forces be put to practical use? It certainly is not a humorous sight to watch whole blocks of houses swaying, cracking and bulging under a bad attack of earthquake, especially if the inhabitants are too insufficiently clothed to go shopping or to play a game of pitch-ball while their dwellings are recovering their usual health.

Then again, it is very seldom that anyone expresses a burning desire for a tornado's friendship. On the contrary, when a brickmaker and a tornado meet, the unfriendly spirit that is shown on both sides is very noticeable. The chief reason for this coolness is that brickmakers do not admire the beauty of the curves described by their hack-caps in the air, when an artistic tornado, disliking the mechanical arrangement of the caps, distributes them in a free and easy manner over the wide world. No matter how many times this artistic re-arrangement may be repeated, the brickmaker most stubbornly refuses to recognize any art in the tornado's work; in fact, he is apt at times to criticise that work in volcanic language, thereby increasing the animosity that exists between weak man and strong natural force.

With the two-fold object of helping the brickmaker and of putting some of these unfriendly but strong and wasteful forces to practical use, I have lately invented two combinations of machines, —which, when perfected, will cause the brickmaking world to stand aghast with wonder.

The name of one patent combination is the Economic, Frog-like, Self-Propelling, Non-Exploding, Non-Flashing, Non-Stunting, Anti-Sulphuric, Heat Absorber, Sun-Concentrator, Vitrifier, Petrifier, Instantaneous Earthquake and Tornado Power Brickmaker. In size it is very little larger than half the State of New York. Several weeks spent in calculation have convinced me than any increase on this size would render the combination somewhat cumbersome. As may be gathered from a perusal of its name, it is worked by tornado power, and is not meant to remain stationary in a brickyard, but to travel the continent and to work as it travels. Roughly speaking, its shape resembles that of a frog with its head carried low and several large warts on its back. In its mouth are two rows of revolving pickaxes or teeth, which dig the clay ready to be scooped up by a row of scoops supplying a conveyor or throat. This conveyor or throat passes the clay to several pug-mills answering to the digestive organs of the monster frog. The mills supply with pug fifty mechanical soft-mud brick molders, which are entirely self-acting, and deliver the bricks upon the ground ready to be acted upon by the burning apparatus erected at the tail end of the Economic, Frog-like, Self-Propelling, Non-Exploding, Non-Flashing, Non-Stunting, Anti-Sulphuric, Heat-Absorber, Sun-Concentrator, Vitrifier, Petrifier, Instantaneous Earthquake and Tornado Power Brickmaker. Several batteries of siege artillery are carried for the purpose of persuading dilatory clouds to shower their weight of rain some distance ahead of the advancing machine and soak the clay. Earthquake power is also used for disintegrating hard marl, tearing up trees, removing tramps or any other obstacles.

With regard to the burning of bricks, American brickmakers need no reminding that the usual method is in these days much too slow. They are also well aware that too many fingers have been burnt by that method. The Economic Frog's method is to burn bricks as soon as they are made, without wasting any heat in burning fingers. As the invention travels—leaving a paving of soft bricks in its rear—a whitish-blue heat is turned upon them from a contrivance that resembles a search-light, which instantly converts them into good, hard, ringing bricks. The act of changing from soft to vitrified bricks is so rapid that they cannot find time to warp or crack.

A few explanatory words concerning the nature of the heat used aboard the Economic Frog-like, Self-Propelling, Non-Exploding, Non-Flashing, Non-Stunting, Anti-Sulphuric, Heat-Absorber, Sun-Concentrator, Vitrifier, Petrifier, Instantaneous Earthquake and Tornado Power Brickmaker may not be out of place. Surely no clayworker, of all men, will quarrel with the statement that the sun is at times far too liberal with its supply of heat. What practical use is served by old Sol in disfiguring women's faces by starring them with countless freckles, or simmering negroes' brains, or peeling the skin from the most prominent organ on the face of a being who was made but a little lower than the angels? Is it a picnic when the States are converted into brick kilns, and the inhabitants into good, hard stocks? From a million throats rendered hoarse and dry by hot sand and kiln dust comes in fancy the roar of a decisive "No!" Well, then, it is this waste of heat that is absorbed and multiplied by a new process and used for brick burning aboard the Economic, etc., etc. Want of space alone prevents my entering into details and explaining how it is done.

The traveling Frog, however, is not restricted in its utility to the soft-mud style; for in a few moments that can be replaced by an auger machine which makes good square wire-cuts. As these leave the cutting-off table they are picked up by an immense scoop and hurled into the air with great force by tornado power. In flying skywards they pass through a beam of white-blue heat cast by the search-light-burning apparatus, being instantly burnt to the requisite degree of vitrification. This style has the following great advantage. A gang of bricklayers can work within easy distance of the traveling Frog, catch the bricks as they descend, and, without further waste of time, lay them on the walls of the building. Of course, it is obvious that the supply of hard, sharp-corners bricks would need regulating by the strong boy—both the enormous soft-mud and auger machines can be run by a strong boy—because if they were showered down too thickly around the workmen, time would be wasted in dodging them.

Another wasteful natural force, and one that seems suited more than any to a brickmaker's needs is the volcano. A slight description of a brickmaking volcano may be found useful. It should be noted in passing, that this is the second of the mechanical combinations that I have lately patented.

From the fiery entrails of the volcano a machine worked by tornado power pumps the molten lava, pugs it by a swift, whirling motion, and raising it to the crater, runs it into a large wet-pan. Around the rim of this wet-pan are placed several immense machines, shaped like hippopotamus heads. These heads dip their mouths into the pan filled with lava, shovel out a mouthful, and bite it into the shape of bricks. In the upper and lower jaws of these mouths are two hundred thousand brick-molds, which are filled with the lava each time the metal jaws dip in the pan, take a mouthful and snap together. When the mechanical hippopotamus-head has in this way taken a bite, a strong, North Pole wind plays upon and cools the jaws, causing the lava in the molds to shrink a little and set hard. Having reached this stage of manufacture, the heads quickly turn on a neck or swivel, the vast jaws open, the bricks rattle loose from the molds, and are spit out with great force to the foot of the volcano, and are quite ready for the builders. Some idea of the hardness of these bricks may be obtained when it is stated that one could be thrown from one planet to another without blunting the sharpness of a corner. A brick-

maker might wear out several pairs of boots before he discovered a quicker method of brickmaking than that of the Volcano, Hippopotamus-Mouth, Lava-Brick, Tornado Power, Lava-Brick System.

But volcanoes, like other machinery, need controlling. An uncontrolled volcano, flinging out now cinders, now badly-mixed lava, now rocks and rubbish, would only make an uncomfortable berth for a brick-gang. If a foot or so of molten lava were allowed to trickle at intervals over the brickyard, the man's bootmaker's bills, especially, would reach a high figure. Such a volcano is of no use to any man, and should only be allowed to participate in a firework display on the night of an election. But no brickmaker, nor engineer—no, not that king of inventors, Edison himself—even after a twenty-course dinner, could dream of a greater labor-saver than a well-controlled volcano. In parenthesis, I may perchance be allowed to state that if natural volcanoes are somewhat scarce in American brickyards, I should be happy to supply a good receipt for making artificial volcanoes, compared with which Vesuvius is a tobacco pipe.

When once the Volcanic, Hippopotamus-Mouth, Tornado-Power, Lava-Brick System is seen at work in America, clay-digging, pugging, drying-sheds, kilns will be dispensed with, and salmon and overburnt bricks will be unknown. Manufacturers will no longer be satisfied with the tedious process of making six bricks at a time; their ambition will be to make a house in one piece. And why should they not? A house is only a large hollow brick with divisions. Buildings of any size and shape should be molded and dispatched to their destinations as easily and quickly as bricks are at the present day.

My Volcanic, Hippopotamus Jaw, Tornado Power, Lava Brick Combination machine renders it possible for any brickmaker to mold in one piece either a cottage or a mansion to any design while the customer waits. My Hippopotamus-Jaw ornamental molds make no more trouble of molding Gothic churches, leaning towers, Chineses pagodas or Norman castles than if these buildings were so many cakes of scented soap. To save American travelers the trouble and expense of visiting Egypt, Palestine, etc., I have a special apparatus that will tumble out Babel Tower and Egyptian Pyramid blocks—the latter being the exact size of Pharaoh's—much quicker than the Quaker makes bricks. Thus it is at last possible for the up-to-date American to erect and climb a pyramid in his own back garden.

As regards the output of my inventions, it has been calculated that fifty Economical Frogs traveling for ten years would scoop the American continent hollow, and one hundred Hippopotamus-Mouth, Volcanic, Tornado Power, Lava Brick Machine would work the kernel out of the globe. Indeed at the end of twenty years it would be dangerous for a 200-lb. man to stamp in anger, as his foot might possibly burst through the thin earth shell.

To those people that are continually croaking of overstocked brick and machine markets, I should like to be allowed to put the following questions: Is the brick market overstocked when Nansen walked for three years round and round the North Pole without once stumbling over a brick? Overstocked! when on his return he most vehemently maintained that the only way to reach the Pole was by a brick pavement? Will any one dare affirm that the market is overstocked in the face of the fact that H. M. Stanley walked through Africa from coast to coast and never once found a brickbat to his hand when he discovered his native carriers stealing his suspender buttons and toothbrushes?

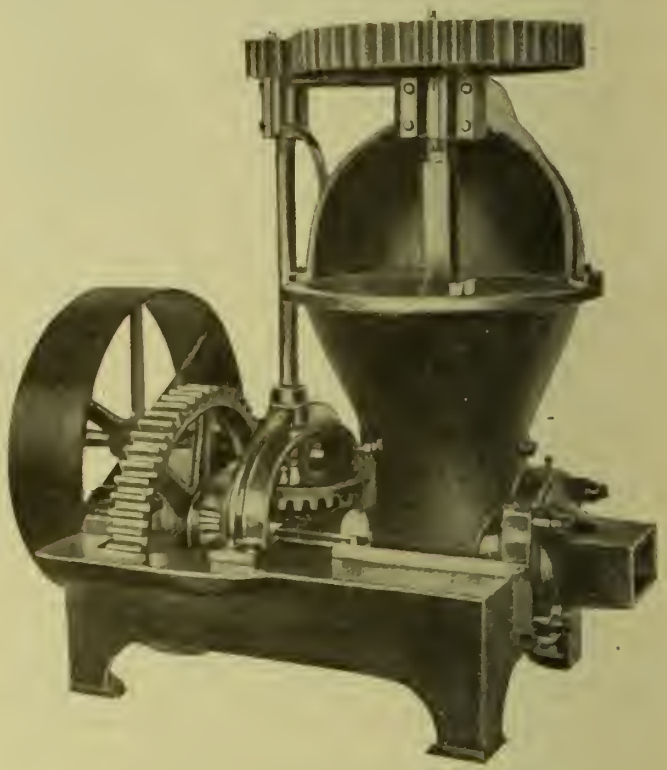
For two reasons I have great hopes that the inventions described above will find favor upon the American continent. First, because the machines are both beautiful in their simplicity and perfectly unique in their practicability, and then because they will help the American brickmaker to satisfy his ambition and mold the continent into bricks.

A Britisher.

The Sword Brick and Tile Machine.

The Adrian Brick & Tile Machine Co., Adrian, Mich., has just issued its catalog on brick machinery. Special attention is called to its Sword brick and tile machines. Two sizes are made, No. 7 and No. 11, and varying in weight, capacity, and requisite horse power to drive them. The No. 7 requires 15 to 20 h. p. to run it and the No. 11 from 35 to 40 h. p. The former has a shipping weight of 2,200 lb. and has a capacity of 30,000 daily and the latter 3,200 lb. with a daily output of 60,000.

These machines take the clay direct from the bank without the



THE SWORD BRICK AND TILE MACHINE.

use of pugmill or disintegrator and it is claimed make brick equal to repressed ones. The tub or upper part is filled with knives which grind the clay thoroughly before forcing it into the augers where it is again mixed and ground and the die is so arranged that it fills the corners firm and smooth. There is no lamination or ragging, a trouble so common to stiff-mud machines. The machines are set up all ready at the factory, tested, and made entirely ready for use. The Sword process is claimed to be the most economical of any on the market. There are as few parts to the machine as possible, consistent with working efficiency, and this simplicity of construction reduces the liability to break-downs and lessens materially the cost of repairs.

Worthy of the Interests It Represents.

The Steubenville Herald-Star, taking note of our heralding the appearance of this superb issue, comments as follows:

"The publishers of 'Brick' take pleasure in announcing that the January, 1902, issue of 'Brick' will be the annual 10,000 edition. This journal is worthy of the great clay interests which it represents, and should be in the hands of every person interested in these industries."

This is also our opinion, and if you know anyone interested in the clay industry who does not subscribe, send us his address and we will mail him a sample copy.

The William Brunt Pottery Company.

One of the foremost potteries of East Liverpool is the plant of the William Brunt Pottery Co., which is located on the corner of Walnut and Cook Sts., one square from the freight depot of the Cleveland and Pittsburg Division of the Pennsylvania Railroad and only two squares from the Ohio River. Thus the very best accommodations are possible for shipment by either rail or water, and the cost for hauling to and from the works is low.

The main buildings are about 240 ft. in length and about 180 ft.

PLANT OF WILLIAM BRUNT POTTERY CO.

in width. All of them are three stories in height and are built of brick.

The plant has, in all, seven up-draft kilns, one 18 ft., two 16 ft. 6 in., three 15 ft. 6 in., and one 13 ft. 6 in. in diameter, and also four decorating kilns.

Of the ware kilns, four are used as bisque and three as glost kilns. The slip-house and engine room are located at the right of the building, the clay bins are located near the slip house so that the clay is loaded into the charging car after being weighed.

The company uses mostly English clays in its mix which is composed of pulverized flint, feldspar, ball or plastic clay and china clay or kaolin. A small quantity of black oxide of cobalt is also added to bleach or whiten it. The whole is placed in a blunging mill, of which the company has three, where it is saturated with water and blunged to the constituency of cream. After coming from the blunging mill, the mix is run onto a sifter or shaker on which is stretched a silk or brass lawn, 120 meshes to the inch, to take out any lumps or foreign matter that may be in it. After being sifted, the mix is then run into an agitator, a cistern built in the ground and having a sweep attached to an upright shaft; this is to keep the body thoroughly mixed and not allow it to settle.

Near the agitator are the pumps and filter presses; these pumps are made with 4-in. upright plungers, floating in a gland of oil, and are run by belt power only. The liquid clay or "slip" is then pumped from the cistern into the filter presses.

The leaves or plates of these presses are covered with a duck sack and the slip is pumped into one end of the press, filling the sacks covering the chambers which have drain holes at the bottom allowing the water to run off, leaving the clay in the constituency of putty.

The clay is usually placed in the clay cellar for a few days to weather or age it. The clay, after coming from the clay cellar, is run through an upright pug mill to thoroughly compress and take the air out of it. As the clay comes from the nozzle of the pug mill it is cut into lengths and is then carried to the floors above on an elevator composed of a belt running over a loose pulley at the top and on which are attached shelves or steps at regular intervals, the elevator being placed on a slant to prevent the clay from falling off in transit.

Going to the clay shops on the next floor, we find at the end of the building what is known as a "Jumbo" jolly, on which any piece from an individual butter to a slop jar or jardiniere may be made. For the large pieces the molds are made in two pieces and the clay is first batted flat and is placed on a "chum" to give it the desired shape to go into the mold, a cloth being used so that it may readily be picked up. The clay is then placed on the interior of the mold and fitted close to the sides by the hands.

On the head of the jolly are placed rings which fit neatly to it, and the inside diameter of which is equal to the outside diameter of the mold. The arm of the jolly is then brought down and the lever pulled forward, throwing the tool against the ware and shaping the interior.

The operation of the plate, saucer and cup jollies is somewhat different from that of the "Jumbo" inasmuch as it is only necessary to pull the handle down to make the ware. The plate and saucer are made with the inside next to the mold, the tool making the outside. The cup is made with the outside next the mold and the inside with the tool. It is necessary to turn the cups and bowls after being partially dried to give them a true, smooth surface. The handles are pressed and are wet and stuck on afterwards.

Some ware is also pressed. The clay is first batted flat and then smoothed with a long knife. It is then placed on one side of the mold, the other one is treated in a similar manner and the two are then placed together and a strap is placed around them to hold them together while working on them. The seam is then filled with clay from the inside and the whole allowed to dry after which it is taken from the molds, handled and finished.

Some ware is also made between two molds and is pressed by the hands, the pressure of the two molds together making the ware.

A CORNER OF THE SAMPLE ROOM.

After being finished, the ware is taken to the green room where it is allowed to remain until taken to the bisque kilns for firing, when it is placed in saggers, white sand being placed between the ware.

The saggers, when broken, are taken to a Patterson 5 ft. pan and are ground into a fine grog and are then mixed with the sagger

clay and tempered; when pugged in the sagger pug mill, this clay is piled in the sagger-makers room.

The clay is then batted flat on an iron plate with a wooden maul after which it is placed over a wooden drum or former which is removed and the sagger dried and burned.

The ware is taken from the bisque kiln to the bisque ware rooms where it is "dressed" and brushed free from sand.

The making of the glaze is somewhat similar to that of the regular body, except that it is placed in what is termed a "glaze mill," ground between two burr stones and is then sifted in a smaller but somewhat similar sifter to that used in sifting the regular body.

The ware is taken from the bisque ware rooms to the dipping rooms where it is dipped in tubs containing glaze after which it is taken to the glost kilns and again placed in saggers, stilts and pins being used to separate the ware. The saggers used in the glost kilns are first washed on the inside with a sagger wash, somewhat similar in manufacture to the glaze, but coarser, to keep them from absorbing the glaze from the ware.

The ware is drawn from the glost kilns and the stilt and pin marks dressed off it with a dressing iron when it is allowed to remain until ordered.

The ware to be decorated is next taken to the decorating department where only the very latest methods are employed. This company runs heavier in filled-in-print work than in any other design, although the orders for decalcomania goods are large. All of the prints are printed from copper plates which are designed and engraved especially for this company. The color is kept warm on a baxton with a steam stove and is smeared on the copper plate. The color is then carefully removed with a knife, only skilled men in this line being employed, as great care must be taken not to mar the plate in the operation. The tissue is then wet with soft soap and is placed on the engraved plate with the dry side next the plate and the whole run through a roller printing press, after being removed from the plate, the tissue is cut by girls and is rubbed onto the ware while warm with soft soap; this is done by girls also. The print is then allowed to dry and when removed, leaves the printed outline upon the ware which has to be filled in with the natural colors by girls.

The company also make a great deal of decalcomania. This is a print already containing the natural colors and which is placed on the ware which has been "sized" before and allowed to dry in the same manner in which a transfer picture may be used.

A new device has been installed in the decorating department of this plant in the way of a tinting machine. It is operated by compressed air, a small pump being used to pump the air into a tank and a rubber hose connecting the tank to the color box, a valve is also attached and below it a glass box containing the liquid color. The compressed air coming through the hose makes the valve act as a syphon and draws the color up and throws it on the ware which is inside of a cast having a pipe at the top to carry off the superfluous color and thus prevent it from entering the lungs of the operator.

The accompanying illustration shows a machine in operation with a ewer partially tinted.

All of the gilding is being done by hand, the ware being placed on a whirler and the gold striped on with a brush while the whirler rotates.

The plant of the Brunt company is complete in every department, and there are employed in all about 175 people, in addition to the traveling salesmen and the office force.

The officers of the William Brunt Pottery Co. are William Brunt, president, and W. S. Brunt, secretary and treasurer.

JUMBO JOLLY.

TINTING WITH A MACHINE.

PRESSING DEPARTMENT.

Obituary.

William Flentke, Sr., for many years manager of the Crown Pottery of Evansville, Ind., died on Thursday, December 12th, after a protracted illness. Mr. Flentke was a native of East Liverpool, O.

Nicholas Kessler, a prominent brick manufacturer of Helena, Mont., died December 11th. Mr. Kessler was well known in industrial and social circles throughout the state and his death is deplored as a public calamity by the Montana press.

Edward J. Mathews, president of the American District Telegraph Co., the White Knob Copper Co., and the Berwyn Ice Co., and largely interested in real estate and street railways in Philadelphia, was killed by a fall from his horse, December 7th. Mr Mathews in 1864 organized the Excelsior Brick & Stone Co. of Philadelphia.

James Herdman, president of the South Zanesville (O.) Sewerpipe & Brick Co., and a director of the Owens' Pottery Co., of Zanesville, died at his home in that city, December 6th, at the age of 80 years. Mr. Herdman was one of the most prominent citizens of Zanesville, being a large stockholder in more than thirty local industrial institutions. His estate is valued at considerably more than $1,000,000.

The Main Belting Co. has introduced us this year to a taking young lady in black and white, in a prominent position on their 1902 calendar. There was nearly a free fight in this office for the possession of this beauteous female.

The National Paint & Manganese Co., Ltd., of Lynchburg, Va., wishes its customers three Merry Christmases and Happy New Years, one on each of three fine pencils, red, white and blue in color. The company reports good business and extensive shipments.

The Ross-Keller Brick Machine Co., St. Louis, reports good shipments and increasing business. A complete outfit of dry press machinery has just been installed at Ruck, Tex., and the prospects for the coming season are more bright than of any previous stage in the company's history.

The First Avenue Brick & Tile Co., of Evansville, Ind., is issuing to its numerous customers a beautiful calendar, with a fine-colored picture of a charming little girl, nestling up to a huge St. Bernard dog. Friends Kleymeyer and Bredencamp know how to captive the eye with a good picture.

Ladies seem to be much in demand this year and a prize has been secured by the Alonzo Curtis Brick & Tile Co., Grant Park, Ill., to adorn its new calendar. The fair skin, rosy checks and blonde curls are typical of some Saxon beauty in Devonshire's country lanes. Tell us where is the original, Mr. Curtis.

Chambers Brothers Co. on January 1st removed its Chicago office from 171 South Canal St., to 59 West Jackson Boulevard. The company will carry a stock of machinery as heretofore and will enlarge it to better serve the convenience of western customers. This branch of the business will continue to be in charge of Davis Brown.

The Burt Manufacturing Co., of Akron, O., has recently received an order from the De Beers Consolidated Mining Co., Ltd., of Kimberley, South Africa, for a very large "Cross" oil filter to be used in its new power house. Only American machinery will be used in this plant and the Burt company considers this order a strong endorsement for its filter.

The C. W. Raymond Co. through its New York office has recently sold a No. 1 combined machine and Raymond down-cut automatic cutter and three Raymond "Victor" represses to the Sayre & Fisher Co., of Sayreville, N. J., and one No. 10 special clay separator, two 14-ft. pug mills, one No. 777 brick machine, and one Raymond automatic cutter to the Copper Queen Mining Co.

David A. Keizer, Winnipeg, Manitoba, Can., has just completed an improved brick machine embodying the elements of a series of molds with compressing dies linked together as an endless chain and provided with clay mixing devices, packing devices for filling the molds and pressing devices combined with a subjacent endless belt carrying detachable pallets for the reception of the bricks from the molds.

The Fernholz Brick & Tile Machinery Co., of 1216 Poplar St., St. Louis, Mo., will be moving early in 1902 into its new commodious new building now in course of completion at the corner of Boyle Ave. and Old Manchester Road, St. Louis. The building is a two-story frame structure of substantial appearance and will offer many additional facilities for the manufacture of the Fernholz products. The new plant is easily reached by the Market St. car which passes the door.

The Charles Warner Co., of New York, Wilmington and Philadelphia, sales agents for foreign and domestic cements, is supplying its patrons with a memorandum book which contains a calendar for '02, '03 and '04, a postal guide and other useful data, all of which are time-savers to the average business man. The book is bound in celluloid and is of the vest-pocket size. The Warner company handles Nazareth Portland cement and Cedar Hollow "Lineoid." The company's New York address is 80 William St.

The Joseph Dixon Crucible Co., Jersey City, N. J., has launched its December issue of "Graphite" before a graphite-admiring public. It contains the usual amount of technical calculations from which we may quote the statement, that the ordinary lead pencil of 7 in. in length is capable of writing the matter for an eight-page paper of seven columns, equivalent to 100,800 words. If any of our readers dispute this statement, the method of its refutation is easy. Some special notice is also made of the value of graphite for the lubrication of gas engines.

The Ironsides Co., of Columbus, O., purveyors of wire rope fillers and shields, boiler scale solvents and cylinder and engine oils, is sending to its customers and friends a neat little souvenir in the shape of a match box upon which are inscribed the various lines carried by the company illustrated by diagrams; the one side is effectively taken up by a colored reproduction of an ironclad bark on the port tack. Her sails are full, and we presume that this is indicative of the winds of prosperity which are pushing the Ironsides Co. to the front.

J. D. Fate & Co., of Plymouth, O., during the month of November sold outfits of machinery to the following: Ferd Groner, Kinton, Ore.; Joseph Goecke, Maria Stine, O.; National Clay Shingle Co., Lima, O.; Columbus Clay Manufacturing Co., Summit Station, O.; Vulcan Clay Co., Wellsville, O.; Iron City Brick & Stone Co., Pittsburg, Pa.; Thomas S. Stewart, Saltsburg, Pa.; Brick & Tile Co., New Bern, N. C.; Straight & Campbell, Lehigh, Ia. Also automatic tables to: Bigler & Co., Harrisburg, Pa.; Star Brick Co., Warren, Pa.; Summitville Tile Works, Montezuma, Ind.; American Enameled Brick & Tile Co., South River, N. J.; Straight Bros., Funda, Ia.; Eldora Pipe & Tile Works, Eldora, Ia. This is a record that the firm may well be proud of and shows that Fate machinery gives satisfaction.

The Stevenson Co., Wellsville, O., is making hay while the sun is not shining. This is a feat which is difficult but the company seems to have overcome all obstructions and, where necessary, makes its own sun. To abandon metaphor and come down to business, the company has been having an unprecedented business this fall. The latest scene of its operations has been at St. Mary's, Pa. Here the Stevenson Co. has just completed building one of the largest and most up-to-date sewer pipe plants in the country. It is equipped with four 66 in. x 18 ft. tubular boilers, one 300-h. p. corliss engine, three iron frame dry pans, three iron frame wet pans, three wet pan emptiers, one 44x21 in. press and one 36x16 in. press. Another special feature of this plant's modern equipment is that it has a complete system of electric lighting throughout. The manager, D. B.

Anderson, is a first-class sewer pipe man and his name is a synonym for business activity and original enterprise. He is well known in clayworking circles. The Stevenson Co. has also just booked an order from the Elk Fire Brick Co., of St. Mary's, Pa., for a complete plant to manufacture firebrick, including the furnishing of engines, boiler and power.

The Turner, Vaughn & Taylor Co., of Cuyahoga Falls, O., has just issued its catalog on "Chain Machinery." It is only a little more than 25 years since this company started the manufacture of chain machinery. It encountered considerable opposition from the trade at that time which was wedded to the old hand system and the Dolly anvil. This time has passed away and for the past ten years 75 per cent of the chain made in the United States has been made with Turner, Vaughn & Taylor machinery. Some of the special machines are the new "Edgecomb" hammer, the "No. 1 Lightning Winder," which coils stock from 3-16 to ½ in. inclusive, and the No. 1 link cutter. The company also supplies a particular line of wire-drawing machinery, steam cranes, acid tubs, lime tubs, water tubs, wire yokes and pins. A copy of the catalog will be mailed upon request. When you write mention "Brick."

C. & A. Potts & Co., Indianapolis, Ind., are issuing a fine catalog with the object of placing fully before the buying public the merits of their various kinds of machinery. Among these machines may be mentioned especially the Potts horizontal stock brick machine, the all-iron vertical machine, the Potts disintegrator, the improved mold sander, and pug mills of several designs with both wood and iron frames. Elevators, steam winding drums, clay cars, trucks and barrows, kiln doors, molds and the thousand and one every-day necessities of the up-to-date brick manufacturer are supplied by the company, and a special feature is made of semi-portable engines and boilers for small yards. All this equipment is thoroughly illustrated by drawings and photographs and intending purchasers will do well to send for a catalog which will be supplied on demand. When you write mention "Brick."

The H. Brewer & Co., of Tecumseh, Mich., have just mailed to us their forty-third annual catalog. Its appearance is an exceedingly attractive one. Embossed letters upon the cover announce its contents and ownership and the dark green color is handsomely set off by silver lettering. Trade seems to have been very good towards the Brewer Co. by the appearance of the lions on the inside first sheet who are having a dance of jubilation around the words "Clay-working Machinery." A careful description is given throughout the book of the various machines made by this company which comprise the following well known models. Wire cut brick and tile machines, mold brick machines, automatic and board delivery brick and tile cutters, hand brick and tile cutters, clay crushers, pugmills for the clayworker and the potter, winding drums, clay elevators, dump cars and friction clutch pulleys. An interesting portion of the book to the man who desires testimonials of merit is offered in the last six pages which, under the heading of "Mile Posts Which Mark the Road" gives an extensive list of the users of Brewer machinery whose united testimony is one of congratulation and satisfaction.

The Roessler & Hasslacher Chemical Co., of 100 William Street, New York, is mailing to its extensive circle of clients a beautiful calendar entitled "The Three Chums." The tinting is very fine and presumably is intended to herald in a tenative degree the possible glories attainable by the use of the many coloring ingredients supplied by this well-known company.

Three other chums are shown throwing dice for a goose in a calendar sent forth by D. J. C. Arnold of New London, Ohio. One of the faces is so jovial that we guess the goose eventually became his. Anyhow, you can obtain a calendar and an answer to the question by application to the company. When you write mention "Brick."

"Brick" recently received from William Raab, of Waterloo, Ia., proprietor of Raab's Art Novelty Works, a most unique example of the potter's art—three perfectly formed jugs measuring but 5/8 in. in height and 7-16 in. in external diameter, suitable for watch charms. The ware is glazed, except for a space of something less than 3/8 in. square on one side and on this unglazed space is engraved the Lord's Prayer. On one jug it is in English, on the second in German, and on the third in Latin.

Such work lays claim to being the most minute engraving on clay in the world and is certainly a trying undertaking for even the steadiest of nerves. Mr. Raab is the artist who made the bust of McKinley in 1896 and presented it to the late President when he visited Waterloo.

The little jugs as mentioned are engraved with the Lord's Prayer in one of the three languages. Persons desiring to secure these charms can get them by remitting 22 cents to Mr. Raab.

Meeting with Success.

Alex A. Scott & Co., of Knoxville, Tenn., who are putting on the market their new patent car and open drying system, report that they are selling hundreds of yard rights, not only in America, but also in European countries. These cars are designed to give every advantage of an artificial drier without the first cost or daily expense, and to furnish a perfect car system with only two cars, and brickmakers should investigate the system. This car is especially recommended to the consideration of makers who dry their brick in open yards, and the makers claim it to be the best friend possible for the brickmaker of the 20th century.

Lake Shore Line to Cleveland.

Delegates and visitors to the convention of the National Brick Makers' Association to be held at Cleveland February 10th to 15th, will find the best of accommodations on the Lake Shore & Michigan Southern Ry. The Lake Shore runs eight trains daily between Chicago and Cleveland and will provide special cars for all attending this convention. The service of the company is unexcelled. F. M. Byron, G. W. A., may be addressed at 180 Clark St., Chicago. All intending to go write to "Brick" and we will secure tickets in advance.

Fires and Accidents.

December 18th, a water tank of the Bessemer Firebrick Co., at Ensley, Ala., was destroyed by fire, entailing a loss of nearly $1,000. The tank was 75 ft. from the ground on a steel structure. A pipe froze, and in endeavoring to thaw it the workman set fire to the woodwork of the tank.

The plant of the Suburban Brick Co., Martin's Ferry, O., was partly destroyed by fire of incendiary origin, December 5th, the loss amounting to $25,000. Fire was discovered at 8:30 p. m. in the boiler house, and spread until, at 11 o'clock, the boiler house, machine shop and dry house were in ruins. Seventy-five employes were thrown out of work until the plan shall be repaired. The officers of the Suburban company are George K. Wheat, president; A. Allan Wheat, treasurer, and C. H. Carpenter, general manager.

The Approaching Clayworkers' Conventions.

Brick manufacturers and clayworkers of every class will be interested in the following announcements of the dates of the various conventions.

The National Brick Manufacturers' Association will hold its 16th annual convention at Cleveland, O., Feb. 12-15, 1902, with headquarters at the Hollenden Hotel.

The annual meeting of the Illinois Clayworkers' Association will be held at Galesburg, Ill., Jan. 7-8, 1902, with headquarters at the Union Hotel.

ILLINOIS PROGRAM.

Tuesday, 10 A. M.

Enrolling Members and Reports.....
Report of Secretary.....G. C. Stoll, Wheaton, Ill.
Appointment of Committees.....

Afternoon Session, 1:30 P. M.

Annual Address by President.....A. L. Converse, Springfield, Ill.
"Where Are We At?".....H. V. Cook, Odin, Ill.
"Factory Leaks".....D. M. Duddleston, Stewartson Ill.
"Brick Testing".....D. J. Christopher,
.....Official Brick Tester, City of Chicago.
"Piece Work".....J. P. Fargo, Streator, Ill.
"Tile Draining".....G. W. Sponger, Cissna Park, Ill.

Morning Session, Wednesday, January 8.

"The Superintendent" .....Eben Rogers, Alton, Ill.
"Avoid Strikes—How?".....Melvin L. Emerich, Chicago, Ill.
"Brick Inspection".....Charles Ridgley, Springfield, Ill.
"What Illinois Tile Manufacturers Have Done".....
.....C. G. Elliott, Indianapolis, Ind.
"The Brick Maker's Dream".....W. C. Campbell, Grant Park, Ill.
Reports of Committees.....
Election of Officers.....

Special arrangements have been made with the Union Hotel to serve a late supper, at which time our special program will be carried out. Headquarters will be at the Union Hotel.

Afternoon of Wednesday will be devoted to a visit to the Mammoth Brick Works at Galesburg.

A. L. Converse, President.

G. C. Stoll, Secretary.

The American Ceramic Society will convene at Cleveland, Feb. 10-12, 1902. Headquarters at Hollenden Hotel.

The next convention of the Wisconsin Clayworkers' Association will take place at Milwaukee, Wis., Jan. 28-29-30, 1902.

The Iowa Brick and Tile Association will convene for the 22d time, Jan. 22-23, 1902, at Des Moines. Ia.

IOWA PROGRAM.

Enrollment.....
Report of Members.....
Selection of Committee on Resolutions.....
Address of Welcome.....
Annual Address by President.....
"Classification and Distribution of Iowa Clays of Economic Importance".....S. W. Beyers, Ames, Ia.
"Drying Clay Ware by Use of Suction Fan".....
.....O. T. Dennison, Mason City, Ia.
"Hollow Blocks and Clay Conduits"....O. C. Pixley, Chicago, Ill.
"Brick Making from Office Window"....M. Joeston, Sioux City, Ia.
"Clay Testing".....I. A. Williams, Ames, Ia.
Beller Drainage Law Discussion..Led by J. B. McHose, Boone, Ia.
"Discussion".....Speaker to be supplied.
"The Future Tile Business".....H. L. Zartman, Sioux Rapids, Ia.
"How to Curtail Fuel Expenses".....H. L. Tramp, Creston, Ia.
"How to Maintain Efficient Laborers".....
.....Discussion led by C. J. Holman, Sergent Bluffs, Ia.
A Preliminary Investigation of the Properties of Gypsum Relative to Its Use as a Mortar in Brick Work..A. Marston, Ames, Ia.
Question Box .....
Report of Committee on Resolutions.....
Report of Secretary.....
Report of Treasurer.....
Election of Officers.....

Robert Goodwin, Jr., Secretary.

George M. Clinger has purchased R. A. Masterson's interest in the Dover (Ky.) Brick & Tile Works and has taken John L. Wilson, of Dover, into partnership. The capital stock will be increased from $5,000 to $6,000, and a new equipment of machinery will be installed.

Dinnie Brothers have decided to rebuild the large brickyards at Grand Forks, N. D., in the spring. A. S. Dinnie was recently in Indianapolis for the purpose of purchasing a patent drier and other equipment to be installed in the yards. The drier is to have a capacity of 100,000 brick per day.

The Norris Mining & Manufacturing Co., which was recently chartered with a capital stock of $150,000, owns 950 acres of coal and fireclay land near Salineville, O., and projects erecting a plant by April next which shall have an average output of 75,000 firebrick per day. J. H. Norris, of Pittsburg, is president and treasurer of the company, and S. J. Burnside, of Burnside & Co., Pittsburg, is secretary and general manager.

The Crown Drier Co.

The Crown Drier Co. of Cleveland, O., reports good fall trade and brilliant prospects for extensive business in 1902. The Cliffwood Brick Co., of Cliffwood, N. J., which installed a "Crown Drier" early in 1901, writes as follows:

"We have now been using your drier for several months and are greatly pleased with it. We are now drying about 5,000 brick each day in each of the ten tunnels, at a cost of about 20 cents per thousand with coal costing $3.00 per ton. It may interest you to know that upon our Drier yard we are making five thousand more brick and with five less men than upon our Pallet yard. This certainly speaks well for your system of drying, and in the near future we shall be ready to talk with you about equipping all our yards with your driers. As you know, we have a daily capacity of about 250,000 brick, and will need several driers to handle them."

Letters of commendation of this practical character need no comment.

A New Acquisition of the Purington Paving Brick Co.

The plant of the Galesburg Brick & Terra Cotta Co. which has been for so many months idle and where the din of whirring machinery has been replaced by the hooting of owls, has been purchased by the Purington Paving Brick Co. The apparatus includes machinery equipments and all the property of the former company. The exact extent of the improvements which will be made by W. Purington is not yet determined but there is a demand for extra working facilities owing to the enormous increase in the trade of the Purington company. A recent addition to the Purington plant was a 90-ton steam shovel of the largest pattern recently purchased by D. V. and W. S. Purington on their trip to the Eastern markets. Visitors to the coming Galesburg convention will have full opportunity to investigate all the improvements made at this go-ahead plant.

The Twentieth Century Down-Draft Continuous Kiln.

Hard on the heels of the continuous kiln man follows the inventor of the down-draft continuous kiln. How efficient these may be it is not in our province to determine, but we take pleasure in heralding this marked sign of progress in kiln betterment and call the attention of our readers to the invention of William Radford, Sioux City, Ia. The first kiln is fired in the usual way and the heat after passing from the crown through the brick to the floor, passes by underground flues, not to the stack but to the bag of the next kiln to it. An ingenious arrangement of dampers enables the burning of any kiln to be under special control and the smoke and gas currents can be turned into the main stack of each. The cost of erection is no more than that of an ordinary down-draft kiln and it is said to be especially adapted for the burning of vitrified paving and dry press brick. Further particulars may be obtained from the inventor, William Radford, Sioux City, Ia.

The Standard Brick Co., of Valley Creek, near Bessemer, Ala., has just completed one of the largest and best equipped plants in the state.

BRICK

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We want our readers to feel always that BRICK is their paper, and that what interests them interests its publishers and subscribers. We will therefore appreciate most highly any communications, questions, experiences or suggestions, or marked copies of local papers containing items of news pertaining to the interests of clayworking.

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VOL. XVI. FEBRUARY, 1902. No. 2

Special Notice.

A number of copies of January, 1902, "Brick" have been returned from the post office because the address had become torn off or mutilated. It is quite impossible for us to tell what these names were, and we beg therefore that subscribers failing to receive the January "Brick" promptly will at once notify us so that other copies may be sent without further delay.

In "Brick" for September, 1901, page 135, we gave an extended review of the steps taken by the N. B. M. A. in formulating specifications for the standard rattler test for paving brick; some time later the N. B. M. A. Committee on Technical Invesigation issued its report, which was a reaffirmation of the method of test as adopted at Detroit in February, 1900 (see "Brick" for March, 1900, page 120), so that this subject is probably well in the minds of our readers. Though the method of 1900 was thus specifically reaffirmed, the committee evidently did not consider this as a final settlement of the matter, because in concluding that report it was said that "pending final action they desire to bring their decision before the municipal engineers of the country."

This desire on the part of the committee was highly commendable and was evidently prompted by recognition of the fact that the municipal engineers, who draw the specifications for brick pavements, and who have the final say as to the quality of the brick placed therein, would be most influential in establishing the practical commercial standard. It should be one of the duties of the coming Cleveland convention to carefully consider the objections that may be urged against the present specifications, and the "Criticism of the N. B. M. A. Rattler Test," which appears on page 69 of this issue of "Brick," is published at a most opportune time. The suggestions made by the author are deserving of special attention, and should be carefully weighed before the Committee or the Association takes final action.

The points objected to in the present specifications are the method of calculating the results and the condition prescribed for the charge.

We have long taken pride in the technical articles on brickmaking which have done so much towards making "Brick" the leading clayworking journal in America, and it was gratifying to meet at Des Moines two members of the Iowa Association, the Messrs. Goodwin, each of whom reported having built in his own yard a dry floor after the plans illustrated in "Brick" for November, 1900, in the article entitled "How to Build a Steam Dry Floor." Both of these floors were reported as having proved most satisfactory.

W. W. Lewis, of Williamsburg, Ia., the president-elect of the Iowa Association, also informed us that it was his intention to soon build a kiln according to the plans shown in "Brick" for January, 1901, in the article on "How to Build a Down Draft Kiln."

Such things as these show the value of a paper like "Brick."

This is the convention season. This issue of "Brick" contains reports of the three state conventions of clayworkers—Illinois, January 7th and 8th—Iowa, January 22d to 24th—Wisconsin, January 28th to 30th—and in the middle of February the American Ceramic and N. B. M. A. conventions will be held in Cleveland.

The conventions of all three of the State Associations were in every way satisfactory—the attendance was good, the papers were up to a high standard and the discussions were active and interesting. The executive officers who arranged for these conventions have every reason to be proud of their work for the past year, and can look to the future with the certainty that their respective associations will continue to grow in numbers and power.

American Ceramic Association.

The American Ceramic Association will hold its meetings at Cleveland on Monday and Tuesday, February 10th and 11th, headquarters being at the Hollenden Hotel.

Plans for the N. B. M. A. Convention.

The 16th annual convention of the National Brick Manufacturers' Association will be held at Cleveland, February 12th to 15th. The plans of the entertainment committee, which comprises W. H. Hunt, president of the association, J. W. Hornsey, F. H. Eggers, W. H. Caskey, S. D. Wright, F. H. Robinson and S. M. Duty, assure that the delegates will be well cared for. Headquarters will be at the Hollenden Hotel, where the annual dinner will be held on Wednesday evening.

The committee on exhibits has arranged for an exhibiting room in a large basement of the Hollenden Hotel, which will be electrically lighted for the exhibition of machinery and appliances in the interest of clayworkers. Space will be allotted to those who wish to exhibit machinery and will be allotted in turn as space is applied for. Electric power can be supplied to those who wish it for the operating of light machinery, arrangements having been made for the rental of motors for power at a nominal sum. Exhibitors will be obliged to pay freight on machinery to Cleveland, also pay rent for motors. The committee desires to make the exhibition of machinery surpass anything that has been done in this line in the past, and those who do not wish to set machinery for operation may show models, working or otherwise. Those who wish merely to distribute among the brick manufacturers in attendance souvenirs or catalogs can secure table room in the exhibit hall.

For further information on this subject application should be made to S. A. Williams, jr., care Atlas Bolt & Screw Co., Cleveland, who is also in charge of the display of sample brick which it is believed will be an interesting feature of the convention.

From the diagram of the exhibit hall sent us it appears that the

space available is about 100x40 ft. Among the firms that had arranged for space were the following: Ohio Ceramic Engineering Co., Wellington Machine Co., Horton Manufacturing Co., Atlas Car & Manufacturing Co.

The exhibit hall will be closed during the hours the convention is in session. Space is free to members and will be allotted by the local committee of which F. E. Frey is chairman.

Thursday morning the delegates and visitors will be invited to go on an excursion as the guests of the Cleveland Hydraulic Press Brick Co. to a number of the interesting brick plants in the vicinity of Cleveland. A special train will be provided, which will leave the Baltimore & Ohio and Valley R. R. station at 9 a. m. The first stop will be at the plant of the Cleveland Hydraulic Press Brick Co., at South Park, O., ten miles from Cleveland, where the famous "Akron" red, impervious and ornamental pressed brick are made. Every feature of the plant will be inspected. The same train will then conduct the visitors to the paving brick plant of the Cleveland-Canton Vitrified Brick Co., where paving brick and block are made by the stiff clay process. From there the train will proceed to the works of the Standard Brick Co., where common building brick only are made by the soft clay process. The next and last stop of the trip will be at the new vitrified brick plant of F. H. Eggers, where shale building and sewer brick are made and burned in round down-draft kilns exclusively.

Thursday evening the central section of seats at the Empire Theater will be reserved for the delegates and their ladies, and following the theater an informal lunch and smoker will be given at the Hollenden for the gentlemen.

The convention sessions will be held in the Palm Garden of the Hollenden. The program includes, in addition to the address of President Hunt, and the routine business, the following:

Address, "A Twentieth Century Retrospect and Prophecy," by Clifford Chase, Milwaukee, Wis.

General discussion, led by Samuel Holyoke, Brewer, Me.

"Experimental Work in Brickmaking," by Eben Rogers, Alton, Ill.

"Modern Brick Plant Prospecting and Construction," by Frank Butterworth, Danville, Ill.

"Brick Roadways and the Improvements of Public Highways," by W. H. Evers, C. E., Cleveland, O.

"The Economy of the Soft-Mud Process," by William Sankey, Pittsburg, Pa.

"Clay as a Commercial Commodity," by S. J. Geijsbeek, Golden, Col.

"Burning Brick With Oil," by George H. Drew, Blue Island, Ill.

"Drying Brick With Waste Heat From Cooling Kilns," by W. L. Sibley, Birmingham, Ala.

"The Construction of Kiln Stacks," by H. B. Camp, Akron, O.

"The Face Brick Proposition," by David C. Meehan, Columbus, O.

"Salt Glazing Brick." General discussion, led by William Cannon, Syracuse, N. Y.

"Is it good or bad economy to use cheap or low-grade fire brick in building or repairing permanent kilns?" General discussion, led by C. B. Stowe, Cleveland, O.

Report of Committee on Specifications for the Construction of Brick Pavements, by D. V. Purington, Chicago, Ill.

General discussion of various technical subjects.

The railroads have made the rate of one and one-third fares for the round trip on the certificate plan; return tickets will be good until Wednesday, February 17th.

The Oakdale Mining Co., of Columbus, O., capitalized at $75,000, has been incorporated for the purpose of mining coal and manufacturing brick and fire clay. J. O. Somers and Robert J. Odell are interested.

Notes from the Southwest.

El Paso, the old Texas-Mexico frontier town, is in a modern brick dress, at least as regards the down-town business section. Brick is cheaper than lumber there. No merchantable timber grows for miles about, timber being brought from Beaumont, Orange and other Texas mills. But of clay there is an abundance, much better clay than one finds in Tennessee, for instance, where clayworking establishments are numerous and operate at great expense. Mexican adobe construction has given the incentive to the local brick industry and this has also been the case in Durango and other points in Old and New Mexico and Arizona The industry, of course, lacks development even at this late day, and has probably been most discouraged by the railroads themselves. A brick structure on the Southern Pacific R. R. system, for instance, would be a novelty. Once the railroads chose this material for building stations, etc., the industry will have overcome its most serious obstacle.

The Mexican adobe structure has done more for the up-building of the brick industry in this territory than all other elements. From these crude clay forms great brick edifices will grow, and we only hope American progressiveness will shorten the period. Lumber will become more expensive no matter what the future production; with the coming ahead of steel and structural iron productions in Old Mexico from home mined raw material, modern architecture will have found the handmaiden it so much needs, for eastern material laid down here commands, as yet, discouraging prices.

Stone deposits suitable for building purposes are rich in southwestern Texas. The development of these quarries added to the ever-growing territorial brick productions will soon solve the problem of substantial modern buildings of all descriptions, these buildings being as vital to commercial and mercantile expansion as has been the case in the forest districts of the Mississippi states.

The advance of American clay products in Mexican consumption is experiencing such remarkable growth. Mexican capital coupled with American expert labor and management is interesting itself in significant undertakings wherever clay deposits promise a future. The American manufacturer's agents do not look askance upon this proposition, but rather welcome the home industry, knowing it to be the most potent factor in creating consumption in directions heretofore latent or indifferent. One of the greatest problems in hand being irrigation, several large plants would for years find a busy scope as regards piping and piling.

Southwestern Texas and Mexico have some of the richest building sand deposits in the Americas, thus assuring the enterprising brick manufacturer a magnificent side line were he to exploit it.

The demand for bricklayers is enormous in the South. This prosperity has attracted the rulers of the union element wherever it exists. Strikes were the usual outcome. At Beaumont and other nouveau riche cities of the South, including the entire rice, lumber and cotton country, $7 per day has been offered and refused, $8 being the rate demanded. Under such conditions the building problem has been seriously impeded.

Sooner or later Texas petroleum will feed all the brick plants in the southeast and southwest, including coastwise points. This will settle the fuel question forever and also enable home manufacturers to undersell.

The impression that "any old brick" will do will at once be imparted upon viewing the material shipped to these rustling "oil-dorado" marts from the distance as well as home. Two-thirds of this material would be rejected under normal conditions. Everything goes now and everything is handled with care. No improvement upon these methods may be looked for until the rush is over. No wonder conflagrations play havoc with such construction.

J. B. R.

A Criticism of the N. B. M. A. Rattler Test.

BY DANIEL B. LUTEN, LA FAYETTE, IND.

Municipal engineers using the standard rattler test of the National Brick Manufacturers' Association for testing paving brick usually specify that the loss to a charge of brick in this test shall not exceed a certain percentage, say 20 per cent. Assuming that an engineer has selected a charge of representative brick, which is of course what he aims to do, and that the loss is found to fall just below the specified 20 per cent, what conclusion can he draw? Only this, that probably more than half of the brick composing that shipment are good. and less than half are bad, as judged by the rattler test. The test as recommended by the N. B. M. A. committee shows, in case the loss falls below the specified limit, that probably a majority of the brick are good, a minority bad; and in case the loss exceeds the specified limit, that probably a majority of the brick are bad, a minority good. And it is subject to the additional accidents that a few very good brick mixed with a lot of poor brick may enable them to pass the test, and that one very bad brick in a lot of good brick may cause rejection.

Let us suppose that a manufacturer has graded his brick at the kiln into lots, one of which will pass a test allowing but 14 per cent of loss, and another of which will pass a test of 25 per cent of loss. The manufacturer secures a contract to supply a city whose engineer specifies that the loss shall not exceed 20 per cent. By mixing the 14 per cent brick with the 25 per cent brick in equal parts, he will be able to supply a brick that will pass the test. And no device of the engineer under the present methods of selection will enable him to successfully reject the bad brick. Yet a worse combination of brick for a pavement could probably not be devised.

It is not to be supposed that the manufacturer purposely adopts this method of grading his brick, in order to pass a given test. By neglecting to grade the brick carefully at the kiln, however, he produces the same result in a lesser degree. The rattler test, if it is to be relied upon almost exclusively to determine the grade of the brick, and this seems to be the present tendency, should include some requirement that would compel the manufacturer to grade the brick at the kiln, and this the present standard does not do. It actually places a premium on lack of uniformity of the material, one of the worst defects that a brick pavement can have. Yet the Technical Committee of the N. B. M. A. and the committee of eminent engineers recommend that the method of computing the loss in percentages of weight of the entire charge, be continued. And the N. B. M. A. Committee adds that the chances of early or important changes are now very slight, and that the standard proposed has won its right to the public confidence and to general adoption.

Professor Orton and the Technical Committee of the N. B. M. A. have done a splendid work for the manufacturers and users of paving brick, and they are deserving of a great deal of praise for their perseverance. They should perhaps be condemned for their attitude of being fearful of compromising the N. B. M. A. by changing the test after it had once been adopted as the standard, for fear certain municipal engineers would lose faith in that standard. Very few municipal engineers are using the test, so few indeed that this phase of the situation would not be worth considering even if it were not thoroughly unscientific, and out of the usual order of procedure as regards the testing of materials. If the committee feels as sure as its report seems to indicate, that the standard as now recommended is not likely soon to be changed, its next action should be to recommend a thorough comparison of the test with the results of actual wear, to be extended over a long series of years. In no other way will the merits of the test be proved, for it is at present based mainly upon theoretical grounds. The committee of engineers has, to be sure, reported that the results of this test "are in accord with the results of the use of the paving brick in actual service." If this statement were true it would settle the matter for all time and there could be no criticism of the test; but the statement was made when barely a year had elapsed in which to compare the test with actual service, and when one considers how little it is possible to learn about the ultimate wear of a pavement in one year after its completion, he will begin to wonder how these engineers could have signed their names to it, and upon what showing the statement is based. Probably upon the report of the civil engineer of Columbus, O., who after a year's experience made the general observation that the results of the test seemed to be in accord with the results of actual service

The standard rattler test as at present recommended for continuance by the N. B. M. A. Technical Committee has at least two defects that are serious, and which municipal engineers must recognize in applying the test if they would secure reliable results. The committee of engineers calls especial attention to the fact that there are large variations in the losses of the individual bricks. and that these losses are due not to accidents of the rattler but to inequalities in the material. Thus in the report, Section IX:— "The work done by every investigator who has yet applied himself to the rattler test for paving brick proves that the results will show a great lack of uniformity which is mainly the fault or peculiarity of the material to be tested." How can there then be any argument for basing the results of a test on the average of such losses, especially when almost every one will admit that one of the most desirable qualities of a paving material is that it should be very nearly uniform in quality. A chain is not stronger than its weakest link, an engineering structure is not stronger than its weakest member, and a brick pavement is not stronger than its weakest brick. The pavement will require repairs as soon as that weakest brick is destroyed. Suppose it be required to determine the strength of a chain by testing a dozen links of the same proportions and material as those of the chain. Would a committee of engineers accept the average of the strength of the dozen links as the probable strength of the chain? If it would, the members would hardly expect to be classed as eminent in their profession.

The clause of the standard specifications bearing on this point reads as follows:

"VII—THE CALCULATION OF THE RESULTS.—The loss shall be calculated in percentages of the weight of the dry brick composing the charge, and no result shall be considered as official unless it is the average of two distinct and complete tests, made on separate charges of brick."

The writer would suggest that this section be amended to read:

VII—THE CALCULATION OF THE RESULTS.—The loss of each and every individual brick composing the charge, shall be calculated in percentages of its individual weight, and results shall be considered official only when two distinct and complete tests on separate charges of brick have been made.

The measurement of the losses in this way would at once enable one, barring accidental losses, to determine the degree of uniformity of the brick composing the charges, and the engineer could specify any limit he might choose for the average of the individual losses, and also a limit to the variation of any brick from the average, which would be a measure of the uniformity of the brick composing the charge. Thus, in a charge of nine

brick tested by the writer, the individual losses were 17.0, 19.3, 22.7, 26.6, 30.1, 30.3, 35.4, 38.2, and 41.0 per cent, respectively. The average is 28.9 per cent, and the extreme variation from uniformity is 12.1 per cent. If the specifications had been written:—"The average loss of the individual brick, tested according to the standard rattler test shall not exceed 30 per cent, with an allowable variation of individual losses from the average, of not more than 10," this charge of brick would be accepted as regards the average of the losses but would be rejected on the score of lack of uniformity.

The average of the individual losses in percentages is practically the same as the percentage of total loss to total weight, provided the weights of the individual brick composing the charge are nearly uniform, as of course they are for any one brand of brick. The suggested amended method of computing the losses would therefore give an average value that would be in practical agreement with the average determined by the present method. Municipal engineers might therefore use this method of specifying losses without departing from the present standard.

The other defect in the present standard specifications is in the clause requiring that the brick shall be thoroughly dry. The section reads as follows:

"VI—CONDITION OF THE CHARGE.—The bricks composing a charge shall be thoroughly dried before testing."

This clause was adopted in order to secure uniformity of conditions, so that tests made according to the standard would be comparable. Several investigators have shown that a given quality of brick would give a loss when tested wet, different from that when tested dry, under the specifications of the old standard N. B. M. A. No one has yet shown that the same variations apply to the present standard method of testing, but it is quite probable that the degree of dryness of the brick does have an influence on the loss that will be sustained in the test. But all investigations along this line seem to show that different brands of brick are affected in different ways by the presence of moisture. Thus one brand of brick may lose more in the rattler test when dry than when wet, in fact this seems to be the general tendency; yet a different brand may behave in just the reverse manner and have a larger percentage of loss when wet than when dry. Thus the tests made by Professor Hatt on wet and dry brick showed that out of seven brands of brick tested, four gave greater loss when dry, one was unchanged, and two gave a smaller loss when dry. The important conclusion is, not that the loss is increased by drying the brick, but that the comparative rating is changed. If the loss were increased in a uniform ratio for all kinds of brick, there would then be no question but that the brick should be dried before testing, both in order to secure uniformity of conditions and to secure maximum loss. But it is only reasonable to suppose that different kinds of brick, having different percentages of absorption, should show different variations in loss for different degrees of moisture, whether in the rattler or in actual service. This being the case there is no assurance that brick tested dry will have the same rating as brick in actual service; for brick in the street are certainly always moist and probably considerably removed from the condition of thoroughly dried brick specified in the standard test. It is quite possible that two brands of brick when tested dry may be given a rating that will result in the acceptance of one and the rejection of the other, and yet these same two brands of brick when tested with a certain amount of moisture present in order to conform more nearly to service conditions, may be given ratings that will result in the rejection of the former and the acceptance of the latter, exactly reversing the order of the two. Under the old standard, the writer has actually known this to occur. Obviously, such a result is not only unjust to certain brands of paving brick, but it is also misleading as to the service that may be expected from the brick tested. The test will not agree with the results of actual service.

The question arises, is there a remedy, and if not might it not even be wise to sacrifice uniformity of conditions to a certain extent in order to approximate more nearly an actual service test. This latter is in effect what most city engineers who are using a rattler test are now doing; the brick are brought directly from the street where they have been exposed to varying amounts of moisture, and, without drying, are tested in the rattler. Whether or not such a mode of procedure is unwise can be determined only by an investigation to show whether or not lack of uniform conditions introduce greater irregularities and discrepancies than failure to conform to service conditions. But there is another and better method. Uniformity of conditions implies only a definite condition that can be easily attained at any time for any brick. Thus complete saturation is just as definite a condition as thorough drying, and more easily attainable. So also is immersion under a given depth of water for a given time. The present standard method requires thorough drying; this is accomplished by heating the brick in an oven until it is probable that all moisture has been driven off. Instead of testing the brick dry according to the standard method, the brick might be brought from the street and placed immediately in a bath of water with one edge of the brick flush with the surface, and allowed to remain until it is probable that they are completely saturated, then placed at once in the rattler and tested. Such a method would require more time, probably two or three days of immersion, than the drying process, but with much less labor and attention. But while there is no doubt that the comparative ratings of the brick would be different by the two methods, there is no good reason to suppose that the rating by the latter method would be any nearer their actual service rating than that given by the former method. Evidently what is required is some intermediate condition of the brick, such as might be attained by a short period of immersion, that would introduce into the brick an amount of moisture to make them conform to an approximate average of ordinary service conditions. The period of such immersion would probably not be long, as there is no necessity for introducing the moisture to a greater depth than will be worn away in the rattler; probably one hour of immersion would be sufficient, although the proper length of time should be the subject of further investigation.

To secure uniform conditions with a short period of immersion, it is necessary first that the brick should be thoroughly dried as for the standard test, then immersed for a given length of time, and then tested immediately. Of course some of the brick will absorb more than others in the given time; some brands might even become thoroughly saturated, and refuse to take up more water, while others might not have absorbed more than one-tenth of their complete saturation. But this is exactly what is to be desired, since this quality of certain brick to absorb rapidly must affect their ratings in actual service, and should consequently be duplicated in the test. If agreement can be reached as to the desirable period of immersion after thorough drying, then all brands of brick would be put through a uniform process from a uniform condition of dryness, and therefore the condition of the charge in all standard tests would be uniform and strictly comparable, besides being in accord with the conditions of actual service. The argument that the test with dry brick is the more desirable because of the greater loss is not important, because the loss in any case is easily measureable without serious error, and, as the committee of eminent engineers says in its report, "Hence we regard all extreme accuracy or refinement in the testing appliances as unnecssary and out of place."

In accordance with the foregoing, a desirable modification of the present standard test might be secured by thoroughly drying the

two charges of brick to be tested, then testing one charge immediately while dry, in the meantime immersing the other charge so that when the first test is completed the second charge will have had one hour of immersion, and will be ready for immediate testing, thus requiring no more time than the present standard method. A comparison of the individual losses of two charges tested in this way would afford far more information as to their wearing qualities and uniformity than the present standard method possibly can, and an average of the percentages of individual losses of both tests would give a rating that would be strictly comparable with others and would conform more nearly to actual service conditions. Testing the brick wet would have the additional advantage of producing fewer accidental losses in the individual brick, as it has been noted that the corners of such brick are not as easily broken off as when tested dry. The clause of the standard specifications might be modified with advantage somewhat as follows:

VI—CONDITION OF THE CHARGE.—Two charges of brick shall be thoroughly dried, one charge tested immediately, the other after one hour's immersion in water with one edge of each brick at the surface.

Eastern Office of the C. W. Raymond Co.

Our readers will be interested in the personnel of the eastern office of the C. W. Raymond Co., through which the company is placing a great deal of brick and pottery machinery. E. P. Raymond is a mechanical and clayworking engineer of long experience who has grown from childhood in the Raymond business, and has made many valuable additions to the line of machinery designed and invented, and long since made famous by his father, C. W.

E. P. RAYMOND.

A. E. DAVIDSON.

Raymond. A. E. Davidson is a younger man in the business, but well informed in its various branches, and a salesman of ability, who ably seconds Mr. Raymond's efforts.

The company's New York office is on the fourth floor of the J. Monroe Taylor Bldg., 39 and 41 Cortlandt St., and a cordial invitation is extended to all clayworkers to call and make this office their headquarters when in New York. A cordial welcome and all possible facilities arep romised.

The C. W. Raymond Co., through its various agencies and the Dayton office, is doing a large business in the clayworking machinery; its officers comprise: President, C. W. Raymond; vice-president, E. P. Raymond; secretary, J. C. Brannock; treasurer, J. L. Schroll; western manager, Topeka, Kan., G. M. Raymond.

R. L. Queisser was on January 16th appointed general manager and assistant treasurer of the Ohio Press Brick Co., and the offices of the company will be removed to Zanesville, O., where all correspondence should be addressed.

Crown Dryer Co. Active.

The Crown Dryer Co., with offices at 914-915 New England Building, Cleveland, O., was incorporated and began business a little over a year ago. The company reports business as having been good, considering the length of time it has been in the market and the fact that its drier is a new departure in the method of drying brick, hot air and circulation being used instead of the usual steam pipes and radiators. This enables bricks to be dried in the coldest weather; in one case where its drier was being used the plant was able to run continuously when the temperature was 6° F. below zero, though the other yards in the vicinity were frozen up for a week. Heat for the "Crown" drier is produced in a fire brick generator from which can be obtained any temperature up to 300° F., and then the gases are forced into the tunnels by means of fans, thus insuring a steady and constant temperature and circulation.

The company is at present erecting a drier for the Harper-Norton Shale Brick Co., Conneaut, O., and two rotary driers for drying clay for the Mertens, Agnew & Phillips Brick Co., Washington, D. C. It is also going to erect next month driers for the Fiske Brick Co., Boston, Mass., and Mr. P. F. Welch, Turners Falls, Mass. Among the orders for last year were driers for the Cliffwood Brick Co., Cliffwood, N. J.; the Richmond Brick & Tile Co., Kreischerville (S. I.), N. Y.; the Ludowici Roofing Tile Co., Chicago Heights, Ill.

Dover Brick & Tile Co.

The firm of Clinger, Wilson & Co. has purchased an outfit of brick machinery from the Wallace Manufacturing Co., Frankfort, Ind., which will be shipped February 1st, and will soon put in a new drying system. This firm succeeds to the plant of the Dover Brick & Tile Co., at Dover, Ky., of which R. A. Masterson and George M. Clinger were the proprietors, Mr. Masterson selling his interest. Mr. Clinger lives in Maysville, Ky., and Mr. Wilson and his son will soon remove to Dover and give their whole time to the plant. The firm has 10 acres of the finest brick clay.

The West Virginia Fire Clay Works, New Cumberland, W. Va., is issuing to all its customers a most handsome souvenir in the way of a pocket mirror set in celluloid, the inscription on the back setting forth the many varieties of clay products which this well-known company places upon the market. Things are booming in Virginia as well as elsewhere.

The Tradesman of Chattanooga, Tenn., has issued its 23rd annual edition and its general appearance, its size and its magnificent illustrations are well calculated to impress the readers with the growing importance of this publication. The quantity of advertisements alone is a sure indication of the financial prosperity of the journal and the wide range of subjects treated in this reading matter gives abundant evidence of its efforts to supply the most correct and extensive information to its readers. We congratulate our contemporary upon its bright prospects for 1902.

F. M. Gardner, of Pittsburg, Kan., has just mailed to us a copy of a handsome book advertising the business and beauties of the city of Pittsburg, Kan. There are over 50 illustrations, made from good photographs, and a short discourse upon the industrial facilities of the city. We glean that Pittsburg was incorporated in 1880 with less than a thousand population, and now boasts of 15,000 who enjoy unsurpassed school, church and social advantages. As a railroad, mining and manufacturing center, Pittsburg seems to be worthy of the consideration of the business investor.

OHIO VALLEY LETTER

FROM OUR SPECIAL CORRESPONDENT

According to reports in circulation the coming spring will witness the erection of quite a number of brick plants in the Ohio Valley, and in this connection it is rather interesting to note the apparent ignorance of the average newspaper reporter in matters relating to the brick industry. For instance: It is not an uncommon occurrence for newspapers in publishing items concerning the organization of new brick companies, to say among other things, something like this: "The company will erect a plant of 100 M daily capacity," little thinking what such an enormous output really means. As a matter of fact, it has been my observation, that such concerns, if they get beyond the embryo state usually commence business with about a 25 M capacity plant. At the present moment I can recall only three plants within a radius of 100 miles of Pittsburg capable of producing 100 M brick per day and I am perfectly safe in asserting there are very few days in the course of a year in which that number of bricks is made. There are, however, quite a number of plants which might be rated at from 40 to 50 M per day, but the great majority of brick plants in the territory referred to are competent to turn out in the neighborhood of 25 M per day. Not only is the average reporter manifestly ignorant concerning the erection of brick plants, but there is also room for improvement in other lines of the same industry. For example: my attention was lately called to an item published in a popular Pittsburg daily relative to the destruction of a certain brick plant by fire in which the startling intelligence was conveyed that "the only portion of the plant which escaped the conflagration was the kilns, and these were slightly injured." Such statements to the casual observer may seem perfectly right and proper, but coming within the scrutiny of a brickmaker, they certainly, to say the least, border on the ludricrous. Of course, on the other hand, a newspaper reporter is not presumed to be an adept in all lines of manufacture and only aims to serve the public by dishing out the news in such language as his limited knowledge of the matter in hand may warrant.

A fire occurred on the morning of January 21st at the Pitcairn plant of the J. M. Runbaugh Brick Co., of Wilkinsburg, Pa., entailing a probable loss of several thousand dollars, confined exclusively to the drying tunnels, which are a complete wreck together with possibly 100 drier cars which happened to be inside. The drier destroyed was a combination system of steam and hot air, the latter being drawn from the boilers by means of fans. There were 12 tunnels with 24 tracks. It is the purpose of Mr. Runbaugh to change this system and begin at once on the erection of another drier which will be a heated air system. It is expected this will be built and the plant ready for operation by the middle of February. This fire certainly comes at a very inopportune time in view of the fact that the Runbaugh company has orders on its books for several million bricks which means that the direct fire loss will not be the only one sustained as that resulting from the subsequent delay will also be a matter of considerable importance, especially considering the fact that the capacity of this plant is upwards of 75 M bricks per day.

The Croton Limestone & Brick Co. has been organized at New Castle, Pa., and will proceed at once with the erection of a plant for the manufacture of brick from fireclay and shale. For some years a company known as the Croton Limestone Co. has been operating an extensive quarry near New Castle, and it is understood the latter concern has been merged into the new company and that the quarries will be continued in operation by the new company, in addition to the manufacture of brick. The material consumed in brickmaking will serve a two-fold purpose in that while it is being converted into bricks by its removal the limestone will be stripped ready for quarrying. It is the purpose of the company to erect a plant that will have at the outset a capacity of 25 M bricks per day, with provision made for doubling the output when occasion demands, by the installation of a second pan, the erection of a few more kilns and an addition to the drier, the power and brick machine to be ample for the larger output. The equipment purchased thus far includes an automatic engine of 130 h. p., two 100 h. p. standard tubular boilers, one Phillips & McLaren, 9-ft. iron frame dry-pan, a union brick machine with automatic cutter, the latter being supplied by E. M. Freese & Co., together with elevators, necessary pulleys, shafting and belts. A Dunlap "Perfect" screen will also be installed and a 5-tunnel Pittsburg hot air drier built. The steel cars for the latter, 70 in number, will be furnished by the Ohio Ceramic Engineering Co. The work of grading for foundations will be started at once and it is expected the plant will be ready for operation some time in May.

An automatic gas regulator has been attached to the boilers at the Toronto (O.) Fire Clay Co's. building brick plant. With the aid of this device the engineer is largely relieved of watching the fires.

It is stated that pipe and brick shipments are continuing unusually heavy in the Ohio Valley for this season of the year, due principally to the fact that orders were held back several months on account of the car shortage, which now seems to be almost over, and the manufacturers are again able to procure box cars in which to make shipments of brick and pipe, much to their relief. The work of loading is greatly facilitated by having plenty of box cars, but for some months these have been almost at a premium and shippers have been glad to get gondolas and for a time even cattle cars and coke racks were received gladly. It is also asserted the outlook for the pipe and paving brick industry for the coming year is very gratifying and gives evidence of being on an equal footing with last year in that respect. It may also be expected that no change will take place in the selling price of these articles, which for over a year have been very satisfactory to the manufacturer.

It is announced negotiations are pending looking toward the purchase of the plant of the American China Co., at Toronto, O., by the Union Pottery Co., of East Liverpool. There seems to be still some little difference in the matter of price (a very important factor in a sale of this charactetr), but it appears this may likely soon be adjusted in which event a deal for the transfer of the property would be consummated.

Capt. John Porter, of Wellsville, O., an extensive brick manufacturer, has purchased the fire brick works of the Furnace Fire Clay Co., located at Irondale, O., together with some 60 acres of adjacent clay and coal property. The plant transferred is of very meagre proportions and has hitherto been operated on hand molded fire bricks. It is safe to predict, however, that Mr. Porter, who is a recognized expansionist, at least so far as the term relates to im-

provements, will make various changes at the plant, largely increasing its capacity. The material there is considered very good and is adapted for a variety of bricks, including the kind now being made, also paving and building bricks. It burns a very light color, an admirable feature for material of that character.

Robinson Bros., the large sewer pipe manufacturers of Akron, O., have lately acquired control of a large factory in the east, from which plant it is the intention to supply a good portion of their eastern trade. The late acquisition is a sewer pipe plant located at Lock Haven, Pa., on which, it is stated, a lease has been secured. Next to the American Sewer Pipe Co., of Pittsburg, Robinson Bros. are considered the largest sewer pipe manufacturers in Ohio and Pennsylvania, controlling as they now do half a dozen plants, located in different sections of the country. James Rainey, a former superintendent of one of the American Sewer Pipe Co.'s factories at Toronto, O., has been engaged to act in a like capacity at the Lock Haven works.

With a capital of $100,000, the Fombell Clay Manufacturing Co., of Beaver County, Pa., has applied for a charter under the laws of New Jersey. Among the incorporators are M. I. Jacobs, Herbert Carlton, A. G. C. Rhoads and W. G. Clark. It is stated 200 acres of clay property have been acquired near Fombell, Pa., and a plant for the manufacture of bricks and other clay products will be built. According to a certain newspaper report which came to my observation, this plant is not only to be the largest in this section, but is at the same time to be built for about one-fourth of what is usually estimated would be required to construct and place in operation such an establishment. The periodical in question places the capacity of the contemplated plant at 200 M bricks per day, and also goes on to say that $60,000 will be expended in its construction. It is therefore probably safe to predict that a plant of about 30 M. capacity may be constructed, in which event possibly $30,000 may possibly be expended. I may be considered a little sarcastic in these things, but I know from a very close observation of such matters that I am right, provided, of course, that the past may be taken as a criterion. Then, on the other hand, it is a public injustice to give out the impression that 200 M bricks a day are going to be thrust on the market, when the probabilities are that 15 per cent of that number would be nearer correct. The brickmaker has troubles enough without contemplating such a condition.

A variety of changes are being made at the building brick works of Gloninger & Co., Vanport, Pa., which, when completed, will possibly place this plant in the front rank among such establishments. The factory is being remodeled throughout and a great amount of new machinery and apparatus are to be installed. The former will include two Phillips & McLaren 9-ft. iron frame dry pans, an E. M. Freese & Co. union brick machine with automatic cutting table, two Dunlap "Perfect" clay screens and a new elevator system. The "Water Proof" brand of bricks made by this company have gained more than a local reputation and the excessive demand for them has brought about this enlargment and re-arrangement of the works. The material here is what is known as the Beaver County fireclay from which it is possible to manufacture a variety of shades of bricks for face work. The shades thus produced range from a very light buff to a dark brown, the latter effect being produced by a certain mixture of the different materials and sometimes a small percentage of shale is added when dark colors are desired. With a variety of material such as is found at the works in question it becomes possible to manufacture almost any shade of face bricks the trade might demand.

Richard Hice, of the Fallston (Pa.) Fire Clay Co., is spending the winter months in Florida.

A large order of building bricks is being shipped by the Toronto (O.) Fire Clay Co. to Chicago. This company has acquired quite a reputation on its buff and mottled face bricks.

The J. D. Fate Co., of Plymouth, O., has placed a combined brick machine and automatic cutter in the works of the Vulcan Clay Co., at Wellsville, O. The Vulcan company is also making other improvements in its plant, and as result the latter will be closed for some weeks.

The Gallatin Fire Brick Works, located near Monongahela City, Pa., is running full time and turning out an extensive variety of different shapes of fire brick for furnace work. The material from which these bricks are made is taken from a near-by coal mine and deposited by the coal company at a point near the grinding pans at the brick works. I am informed this material is considered valueless by the coal operators and ordinarily is allowed to either remain in the mine, or if occasion demands that it be hauled out, it is dumped over the hill as refuse. In view of this the material is procured by the brick company at a very reasonable figure and far below what is usually paid for mining fireclay. About a year ago one of the fire brick plants of the Gallatin company was destroyed by fire and the one now being operated is the company's original factory and in some respects is a little antique in its equipment, that is, so far as the buildings are concerned at least. The drier and kilns, however, seem to be producing very satisfactory results. The kilns in use are of a down-draft variety and of a pattern particularly adapted for the work intended. They are quite small, having a possible capacity of about 25 M each. The plant is furnished with 12 of these small kilns. I am informed the Gallatin company will shortly begin the erection of a new and modern fire brick factory on adjacent territory, upon completion of which the old one may be abandoned.

It is expected the large plant of the East Ohio Sewer Pipe Co., now in course of erection at Irondale, O., will be ready for operation by April 1st. The principal office of the company is to be at the works, and this I am informed will be in charge of Fred O'Wesney, of Steubenville, O., who recently resigned his position with the American Sewer Pipe Co., of Pittsburg, to become identified with the Irondale concern. Mr. O'Wesney has had many years experience in the sewer pipe industry and prior to the formation of the American company was connected with the Great Western Fire Clay Co., of Toronto, O. Other members of the East Ohio company have also been identified with Ohio Valley clay industries for a number of years.

The Good Roads Machine Co., of Kennett Square, Pa., has placed a rock crusher at the Blackhorse works of the American Sewer Pipe Co., at New Cumberland, W. Va. With the installation of this machine the services of quite a number of workmen will be dispensed with and in addition the wear and tear on the dry pans will be materially reduced. The crusher placed in this plant is a large one and capable of crushing 250 tons of fire clay daily. A similar machine has also been placed in the Freeman brick works of the American company. In this connection I might also state that the practice of using crushers in connection with dry pans has become quite common among Ohio Valley fire clay works, and the plant which does not possess such a machine (especially where the material used is of a hard nature requiring a considerable amount of sledging in order to prepare it for dry pans) is not in these times considered altogether up-to-date. Almost all new plants which have been built in the fireclay region during the past year or so have embodied in their equipment a rock crusher, and these machines have also been installed at a great many of the older works.

What is known as the Franz brick plant, situated at Wittmer station on the Pittsburg and Western Railroad, a few miles north of Allegheny, has been purchased by a new company and will be placed in operation at an early date. The Franz plant has been idle for some years, and as a result a considerable amount of repair work will become necessary before brickmaking may be resumed. This plant, in its day, was considered the best equipped red brick

factory in the Allegheny district and is possibly as large as any there at this time. It is equipped with large engine and two boilers, ample drier and kiln capacity, also an extensive machinery building. A soft mud machine was formerly used here, but it is the purpose of the new owners to make stiff mud bricks on a Freese machine and automatic cutter, an order for which machines has been placed. An order for 80 single deck steel cars has also been given to the Ohio Ceramic Engineering Co., of Cleveland. With the new additions this plant will have a daily capacity of 60 M bricks. The new company has applied for a charter at Harrisburg under the style of Enterprise Brick Co., of Allegheny, and will be capitalized at $25,000. Frederick Herman, of Allegheny, seems to be the leading spirit in the new concern, and associated with him are certain prominent business men of the same city. Mr. Herman is a brickmaker of many years' experience. In addition to the territory purchased with the works, the company purposes buying adjacent shale property to the extent of some 10 acres. The work of placing the plant in order has been started and it is the expectation to have bricks on the market by early spring.

Gloninger & Co., of Vanport, Pa., have placed an order with the Atlas Bolt & Screw Co., of Cleveland, for double deck steel drier cars.

In order to make room for additional kilns, the Miller Brick Co., at Rochester, Pa., is cutting off a section of the hill adjacent to its plant and the material thus removed, which is a very hard shale, is made into red bricks. When this work is completed, the company will begin the erection of two down-draft kilns, the same pattern as those now in use at the works, thus increasing the capacity to the extent of several thousand bricks per day. The Miller company has hitherto been considerably handicapped in the kiln department of its plant.

It occurs to me there is considerable variance in the amount of wages paid bricklayers in different sections of the state of Pennsylvania. During the past year the rate per hour as fixed by the unions in Pittsburg has been 50 cents, or $4.50 for a day of nine hours, and I am informed by members of that craft it is their intention to ask an increase of 5 cents an hour the coming spring. Compare, if you will, this rate of wages with that paid for the same class of work in other parts of the state. In a late conversation with a brickmaker residing some 250 miles from Pittsburg, I received the rather surprising intelligence that bricklayers in his section were receiving $2 for a day of 10 hours, and it was an easy matter to secure as many men as required at that rate. Not only do Pittsburg bricklayers receive greater wages for their labor, but in addition, during the past year or two, that class of workmen have been hard to procure, and at times have been secured at a premium of a certain sum per day over the regular union wages. From what I gather of the outlook for building operations for the coming year, I am convinced this will be no exception to the last, and as a result bricklayers will command almost anything they may ask. In view of these facts, if the condition of things in Pittsburg were generally known, it does seem strange to me that bricklayers do not emigrate in large numbers to that city from sections of the country where the meager rate wage is in vogue.

James Deemer, of Yonkers, N. Y., has purchased the property of the New York & Pennsylvania Brick, Tile & Terra Cotta Co., located near Stroudsburg, Pa., and an 11-mile steam railway known as the Chestnut Ridge line which affords connections with the plant.

Will R. Patrick, manager of the Jonesboro Brick Co., Jonesboro, Ark., reports that the company had an excellent year. In 1901 nearly four million bricks were made and sold, and the prospects are bright for the spring trade. Mr. Patrick also says he could not do without "Brick."

A Word About the Horton Co.

We believe our readers are all more or less interested in the rapid growth and development of the manufacturing industries of the country in general, and especially so in the line of manufacture that relates to their particular business, as the better the facilities for turning out good brick and handling them in an economical manner, the more profit there is in the business for the brickmaker. Among the progressive concerns that have rapidly forged to the front as makers of brick machinery and brick yard supplies is the Horton Manufacturing Co., of Painesville, O. The rapid growth of this company would in any other country than the United States be considered marvelous, and even here it can be taken as an evidence of the push and energy back of it, and the popularity of its product.

In the early nineties, Charles H. Horton, who had for many years been connected with the brick machinery business, being an expert on any question pertaining to that industry and also having the requisite mechanical knowledge to thoroughly understand the technical points in regard to the various kinds of machinery required in clay working, patented several different styles of brick machines and began making them in Painesville.

Introducing new machinery on the market, by a new company is no easy task, and although the volume of business for the first year or two was not large, Mr. Horton kept at it, being fully convinced that he had struck the right principle for the making of brick at the lowest possible cost. In this opinion he was warmly seconded by many of his brickmaking and mechanical friends who had thoroughly investigated his ideas and had placed orders for the first machines, long before they were completed.

The company has made rapid growth, and a few years ago incorporated in Ohio as a stock company with a capital of $50,000. During the summer of 1901 the capital was increased to $100,000. Many enlargements and additions to the original plant have been necessitated by the increasing output, until today the company can care for large rush orders with promptness and despatch not usually encountered.

Mr. Horton, who is the president and treasurer of the company, has spared no effort or expense to make its line of soft-mud brick machinery the best on the market today. Having been constantly on the alert for new ideas, many improvements have been made on the original design of the machines and they are kept up-to-date.

The company's "leader" is the "Hercules" horizontal soft-mud machine, and is designed for the largest yards in existence making common or fire brick. The "Standard" soft-mud machines are close seconds in popular esteem; these latter are of the upright style, designed for medium sized yards and can be operated by either steam or horse power, and are also inter-changeable.

This company claims to be the largest manufacturers of soft-mud brick machinery in the United States, as its line consists of 11 different styles of machines, from the inter-changeable horse power to the largest No. 4 silica brick machine. Besides the machines above mentioned, the company makes everything required to equip a first-class brick making plant, and every article that leaves their factory is backed by the reputation for square dealing, which the Horton Manufacturing Co. has established for itself among the brickmakers of the United States.

Fredericks, Munroe & Co., brick manufacturers of Pottstown, Pa., are completing an additional plant at Millhall, which will give the company a total annual output of 36,000,000 firebrick. The product from the two plants operated last year amounted to 20,000,000 brick, which were shipped to all points from Maine to Texas and from Canada to Georgia.

Illinois Clayworkers' Association Twenty-Fourth Annual Convention, Galesburg, Jan. 7-8, 1902.

There could not be a greater contrast in weather conditions than those which prevailed at Galesburg this year and at Springfield in 1901. At Springfield on the second day of the convention it was necessary to drive to the court house through blinding sleet and snow. At Galesburg the sun ruled over all the proceedings with the utmost warmth and geniality and it was very difficult to believe that we were in the heart of winter. Galesburg has always had peculiarly pleasant reminiscences for us. It was one of the first cities we struck in the west, and its brick streets, mammoth brickyards and its courteous inhabitants commend themselves favorably to every visitor.

ILLINOIS CLAYWORKERS' ASSOCIATION AT GALESBURG.

The headquarters of the convention were at the Union Hotel, and on the night of the 6th already quite a number of names of well-known clayworkers were to be found on the hotel register, among which were those of the Iowan clayworkers, C. J. Holman and W. B. Lower. In the morning there was also a considerable increase and the clayworkers found their way to the city hall in good time, the convention commencing promptly at 10:40. There was not such a large attendance of Illinois men as we anticipated and compared with the attendance of last year there was a marked decrease in home representatives. This may probably be due to the great boom which is taking place in building materials and the remarkable fineness of the weather had compelled the clayworker to stay at home and finish his work. However it may have been, it was a great pity. On the other hand, the attendance was larger than that of last year, but the numerical increase was due to the presence of representatives from other states, several coming from Iowa, Nebraska, Indiana and Ohio. These came mostly because they do not intend to be at the National convention at Cleveland this year, so that it is possible that this convention will suffer to that extent. Business is very good and the manufacturer feels that he can rise best on the flood-tide of approaching prosperity by keeping his eye strictly on his business.

We present below those that answered to the roll call:

F. Plumb, Streator, Ill.

A. Connor, Montezuma, Ind.

Fernholtz Brick Machinery Co., St. Louis, Mo., represented by J. B. Beall.

D. C. Heager, Dundee, Ill.

J. B. Fargo, Streator, Ill.

A. E. Gregg, Waverly, Ill.

George J. Walters, Chatsworth, Ill.

H. Brewer & Co., Tecumseh, Ill., represented by Charles Burridge.

C. A. Swift, Waverly, Ill.

A L. Converse, Springfield, Ill.

Charles Ridgley, Springfield, Ill.

F. W. Heidenrich, Hedrick, Ia.

G. H. Kettell, Tipton, Ia.

Madden & Co., Rushville, Ind.
C. J. Holman, Sergents Bluffs, Ia.
W. R. Cowen, Sioux City, Ia.
Robert Goodwin, Redfield, Ia.
"Brick," Chicago, Ill., represented by H. de Joannis.
W. Lareau, Beaverville, Ill.
F. Carter, E. Peoria, Ill.
G. C. Stoll, Wheaton, Ill.
American Clayworking Machinery Co., Bucyrus, O., represented by Lew Thorn.
Chambers Bros., Philadelphia, Pa., represented by Davis Brown.
F. A. Martin, Mazon, Ill.
H. S. Curry, Reddick, Ill.
Leader Manufacturing Co., Decatur, Ill., represented by E. B. Johnson.
John Jansen, Pekin, Ill.
Charles Zoeller, Pekin, Ill.
Chicago Brick Machinery Co., Chicago, Ill., represented by H. D. Hopkins.
L. H. Lambert, Beaverville, Ill.
J. B. McHose, Boone, Ia.
Mamer Bros., Campus, Ill.
Clay Record, Chicago, Ill., represented by G. H. Hartwell.
L. H. Martin, Dwight, Ill.
Drainage Journal, Indianapolis, Ind., represented by C. G. Elliott.
Tiernan Bros., Macomb, Ill.
Illinois Manufacturing Co., Macomb, Ill., represented by I. H. Millsom.
John Moroney, Chicago, Ill.
Fincetemaker Bros., Ellsworth, Ill.
W. Hammerschmidt, Lombard, Ill.
Wm. Lutton, Table Rock, Neb.
T. A. Randall & Co., Indianapolis, Ind., represented by T. A. Randall.
T. Townsley, Alexis, Ill.
W. S. Purington, Galesburg, Ill.
D. O. Loy, Wataga, Ill.
H. F. Townsend, Avon, Ill.
W. M. Pratt, Earlville, Ill.
F. E. Swift, Washington, Ia.
Simpson Manufacturing Co., Chicago, Ill., represented by J. S. S Simpson.
H. E. Potter, Kewanee, Ill.
R. M. Woods, Chicago, Ill.
George Cotton, Table Rock, Neb.
C. C. Barr, Streator, Ill.
Eben Rodgers, Alton, Ill.
H. Churchill, Buda, Ill.
S. H. Alsip, Belleville, Ill.
J. A. Day, Belleville, Ill.
Ferdinand Adams, Indianapolis, Ind.
J. W. Skinner, Varna, Ill.
Robert Unziker, Peru, Ill.
A. S. Giles, Peoria, Ill.
Frost Manufacturing Co., Galesburg, Ill., represented by Andrew Harrington.

Mayor Bradley offered the clayworkers, in a concise speech, the freedom of the city of Galesburg. He referred to the enormous brick industry of the city and stated his belief that the brick pavement was superior to any pavement in the world for municipal purposes, not excepting its keenest competitor, asphalt.

REPORT OF SECRETARY STOLL.

Four years ago, at a meeting of the Illinois Clayworkers' Association, a motion was adopted that the clayworkers of Illinois exhibit annually, specimens of their various products at the State Fair, Springfield, Ill., and that the officers of the association have charge of the exhibits. For two years the officers reported an almost total failure, owing to the manufacturers' neglect in sending exhibits. Each year the secretary invited manufacturers to send exhibits, assuring them that their exhibits would be properly taken care of, and exhibited as advantageously as possible; also that no charge would be made for exhibiting. Still we received no encouragement from manufacturers; therefore, the State Board of Agriculture almost decided that the clayworkers could not, or would not, send a creditable display, and decided not to help the association to pay any expense for attendants to arrange and attend the exhibit. However, the officers made another attempt last fall, and made strenuous efforts to enlist the co-operation of the manufacturers, and we are pleased to report that we received splendid specimens from a few manufacturers, and with what we already had, made what we were informed by the fair management, a very creditable little exhibit, and, inasmuch as it was attracting a great deal of attention and no little admiration, they

G. C. STOLL.

hoped that next year the manufacturers would all respond, and not only do credit to themselves, but to the clay industry of our state.

Mr. H. F. Townsend and the secretary went to Springfield to arrange and attend the exhibit, and were given every encouragement and aid by the fair management.

The exhibits included the following:

Newbern Brick Co., Newbern, Ill., panel 36 x 40 in. of red pressed brick, with white strips between each brick, imitating a section of wall.

LaSalle Pressed Brick Co., LaSalle, Ill., 50 bricks representing some of the company's various colors and glazes.

White Hall Sewer Pipe Co., White Hall, Ill., sewer pipe, large drain tile and flue linings.

Purington Paving Brick Co., Galesburg, Ill., paving brick and sidewalk tile.

Macomb Pottery Co., Macomb, Ill., stone fruit jars, with screw tops, in pints, quarts, half gallons and gallons.

Argillo Works, Carbon Cliff, Ill., fireclay cupola blocks, firebrick and sidewalk tile.

Barr Clay Co., Streator, Ill., paving brick and sidewalk tile.

McCabe & Son, Rushville, Ill., glazed and unglazed drain tile.

Mamer Bros., Campus, Ill., drain tile, hollow blocks, sidewalk tile and brick.

Springfield Paving Brick Co., Springfield, Ill., one panel of street paving, 36 x 36 in., one panel sidewalk tile, 36 x 36 in., one panel of vitrified building brick, 36 x 36 in.

Waverly Tile & Coal Co., Waverly, Ill., drain tile and building brick.

Ludowici Roofing Tile Co., Chicago Heights, Ill., specimens of roofing tile in various designs and glazes.

Tiffany Pressed Brick Co., Momence, Ill., enamel bricks in white and colors.

D. M. Duddleston, Stewartson, Ill., drain tile, sidewalk brick and building brick.

The exhibit was given a prominent place in the Dome building, and was arranged in an octagon pyramidal form, thus displaying every piece of ware. We had several inquiries for each of the following wares: Drain tile from 12 in. to 24 in., sewer pipe, sidewalk tile, roofing tile, and building brick. These inquiries were all referred to exhibitors, giving the name and address of each, and we hope that this year the manufacturers will all send specimens, that we may have a large and creditable exhibit.

Your secretary met Mr. F. J. V. Skiff at St. Louis, who was the director of exhibits at the Mines and Mining Building at the World's Fair, Chicago. Mr. Skiff is a director of exhibits at the Louisiana Purchase Exposition at St. Louis. Mr. Skiff said he remembered with pleasure our large and complete exhibit at the World's Fair, Chicago, and hoped we would do as well at St. Louis, and very much desired to have the matter brought before the association, and communicate with him as early as possible.

The necessary committees were then appointed and the convention adjourned till 1.30 p. m.

Tuesday Afternoon.

PRESIDENT'S ADDRESS.

The position of president is one which is often sought and seldom attained, the seeking of which has caused many great men to sing the pathetic refrain, "This is the way I long have sought, and mourned because I found it not."

I stand before you as a president whose duties now commence, notwithstanding I was elected one year ago. In this audience today are a number of my predecessors who have each in turn filled this presidential chair with credit to himself and honor to this association, men whose wrinkled faces and bald heads speak volumes for the faithful services rendered this association in days gone by.

This honor came to me unheralded and unsought, and I today can heartily join with all of my predecessors in the language used by the whale when emitting Jonah, "It is hard to keep a good man down."

I have done my best thus far to properly fill the position with which you honored me a year ago, and am now willing to cheerfully admit what so few presidents are willing to do, that the magnificent salary received by me has been equal to the services rendered, notwithstanding the onerous duties devolving upon the office.

I appreciate greatly the honor of being called Mr. President; it is such a relief from the professional title Doctor, which seems to me is getting somewhat threadbare, and not appropriate since becoming a fellow-craftsman with professional men engaged in maniuplating Mother Earth. I am frank to state that I do not think my present occupation less honorable than that of the practice of medicine; in fact, I find a striking resemblance in the work, both jobs having to do with clay products in both normal and abnormal conditions. Yet I must admit that an amputation with the bistoury, scalpel, and tourniquet, is more scientifically done, than by the grinding process of the pugmill.

(Referring to the prosperous times which have ruled during his year of presidency Dr. Converse read two letters, which revealed to the admiring audience an intellectual skirmish between an Ohio rubber belting company and himself. The former used a forest of happy phrases about the beauties of early summer and holiday pleasures to veil a direct appeal for a consideration of quotations for their rubber goods. To this the Doctor replied in equally merry strain and heralded an appeal for their adoption of brick pavements around their rubber plant by philosophic reflections on halcyon days and summer zephrys coupled with rhapsodic tranquility.)

As president of this organization it becomes my pleasant duty to deliver this my annual message. I am happy to report that the Maker of the universe has given us an abundance of material with which to work.

Also that we are at peace with all the world, except the labor organizations that want better wages, the contractors that want cheaper products, and our wives which have thus far failed to receive the sealskin cloaks that we thoughtlessly promised them when we undertook the laudable enterprise of making brick.

As to foreign trade Cuba and Canada have been knocking at our doors for brick with which to improve their streets, while every

DR. A. L. CONVERSE,
President.

known portion of the civilized world has furnished a market for our machinery and kilns. All of which has resulted from perusing the pages of our unequaled trade journals which are so ably represented here today. We have kept pace with other manufacturers in our chosen industry, both in the output in our products and the extension of our plants, and have created a demand that will keep our craft exceedingly busy to supply the requirements of the trade.

The rapid destruction of our lumber resources gives assurance that a substitute for wood in building material is greatly in demand. And the very unsatisfactory results in the various asphalt products, as demonstrated by the constant and continued repairs in the streets of our larger cities, give us a renewed assurance that brick pavements have come to stay.

The unprecedented demand for our product in the last few years have given an encouragement to our industry, which had not been anticipated by the most hopeful and sanguine of our manufacturers.

While we do not wish to encroach upon the domain of the politician, we can but cheerfully voice the sentiment heard from every portion of our country, that these are exceedingly prosperous times, and that with this prosperity none have enjoyed more satisfaction from the results of their labor than the members of this association.

With brick, terra-cotta, fire-proofing, roofing and floor tiles for our buildings, drain-tile and sewer-pipe for our drainage, conduits and protectors for electric wires, and vitrified brick for street pavements and sidewalks, it surely looks as though the clay industries would not soon languish for want of their products.

The diversified programme submitted to this convention for discussion it would seem would be sufficiently suggestive to bring out the very best thoughts from the intelligent and successful manufacturers in this presence.

It is to be hoped that every topic will be freely discussed, not in an academic way, but from the practical standpoint so well understood by you all, that our convention may not only be a means of enjoyment but a source of real profit to each member.

A paper was to have been delivered by Mr. Pike of Chenoa, Ill., on "Tiling Highways." Mr. Pike being absent, the president called upon Mr. Curry of Reding to open a discussion on this subject. He said that in a country like Illinois, where there are no gravel pits, tiling the highways on each side is the only way to make good highways. Around Bloomington the roads were graded level so that three teams could pass and in other places the grade is so sharp that two teams can scarcely pass each other in safety. He felt sure that the subject deserved more attention from the farmer, the tradesman and the whole community than they had yet given it.

Mr. Townsend referred to a half a mile of prairie road which was very bad in the springtime, which was made one of the best roads in the country by the placing of a 6-in. tile down the center of the road, and by turnpiking and tiling along each side of the road.

J. C. Mamer made several cogent remarks and quoted a case of a mile of very bad roadway which the commissioners and near residents decided to tile with 4-in. tile. In the low places holes were dug 3 ft. in depth around the tile and filled with broken rock. Now this road is the first dry in the spring and is maintained at a fifth of the former expense.

The first thing to make a road is to drain it, give it a good base and then if gravel is available to fill it in with that material.

C. G. Elliott spoke with a 20 years' experience in road tiling. He told of the infancy of farm drainage and referred to a subscription that was made up in La Salle County, near Ottawa, for the purpose of tiling a bad piece of road with 6-in. tile. Since then the defects of that roadway have been done away with. He considered the practice of placing the tile on the sides of the road preferable to laying it in the center.

The next paper was that by Mr. Cook of Odin, Ill., entitled "Where Are We At?" Owing to Mr. Cook's Cook's indisposition he failed to appear and the paper was read by Secretary Stoll. The subject was treated in a remarkable way, comprising a history of the brickmaking industry from before Adam down. Many Biblical episodes were related, including the incident of Eve and the serpent and the remarkable brickmaking ventures of the Jews in Egypt. Mr. Cook's main point was to show that the clayworking industry has always held a prominent place in the history of the universe.

H. V. COOK.

In conclusion Mr. Cook comments on the prosperity of the industry:

Busy all over the face of the earth, turning out the same useful utensils, multiplied by millions, we find Europe and America taking the lead. Thousands of men, women and children are employed turning out almost every conceivable thing for the comfort, convenience and welfare of man. Thousands of acres of sheds and buildings erected for the convenience and comfort of those employed, testify to our standing at the commencement of the nineteenth century. The whole enlightened world must admit that the product of clay was the first, best, most durable, most useful, and the most intelligent of all things ever created.

From this point let us look back through the great valley of death and see the thousands and thousands of our brethren strewn on every side of these great highways who have done their duty as they saw it, but have returned to the dust. Along these same great highways we find their products, burnt clay strewn on every side, in good state of preservation and in many places as perfect as when they created it. Clay it was, but to clay it was never to return.

And in the future, with our improved machinery and improved kilns, there is no reason why we should not hold until the end of time the same position we have always occupied, and when the end comes if, as predicted, by fire, a great deal of our ware will be improved or benefited.

FACTORY LEAKS.

By D. M. Duddlesten, Stewardson, Ill.

Factory leaks are almost too numerous to mention, but I will try and discuss a few that I have noticed in my experience. The first was in locating my factory too far from the market. It has been said that "the man who is farthest from market is he that has nothing to sell," but with our yard full of tile sometimes we

D. M. DUDDLESTEN.

imagine we are like him with nothing to sell. However, it's getting better.

The next leak I shall notice is the selecting of a location of the clay bank away from railroad facilities, another bad leak. We should get near a good railroad center if possible, and be sure we have the proper clay for the ware we propose to manufacture. Next in importance is the selection of machinery and the setting of it in

proper shape to avoid those leaks that are so often made in this way.

Then comes the tempering of the clay, sometimes baffling the best of us. There was a man once said: "I could graduate with honors, but I can't temper clay."

Then we come to the cutting tables; here we have had more leaks when the tables were not properly adjusted and of an inferior quality. To begin with we should have the best to avoid cutting ill-shaped ware.

In the setting of brick or tile in the shed or drier in a careless way and also in taking them from the shed to the kiln, we have seen some bad leaks. Having rough floors or track to haul over makes another. In setting brick in the kiln, crowding or setting too close will prevent there being sufficient space for the hot gases; there must be room for these or we will find another leak. In firing sometimes too much fire and other times not enough is expensive.

The same might be said of the draft, oftimes not enough, other times too much; here, we believe, there are large losses. When the kiln is thoroughly heated we should have very little draft to hold and save it.

We might name many leaks, but one of the worst we know of is the cutting of prices. We know of three or four factories within a radius of a very few miles that have gone out of existence, we verily believe, from this very cause. and have left nothing for a memorial but a lot of bats, broken tile and excavations in the ground, where there should be a thriving business carried on in the manufacturing of clay products.

The last leak I shall speak of is the selecting of careless, indifferent men, who care only for noon, night and pay-day. If possible we should employ men who will take some interest in the welfare of our business, thereby stopping many leaks that the other fellows let go. It does appear to me with the great improvement of the clay-working machinery, kilns, driers, etc., that we should be able to stop many of these leaks and many more that have not been mentioned.

The manufacturers of clay-working machinery deserve great credit for the untiring interest they have taken in the improvement of this class of machinery. Perhaps some one may say we all knew that, but is it not a fact that we all know better than we do? With the flattering prospect of a great demand for our products in the near future, we should take courage, stop the leaks, and go right on, for nothing succeeds like success.

This paper aroused but little discussion. Dr. Converse thought that wrong bookkeeping was the worst possible factory leak. The conversation on this subject drifted into the question whether when the kiln is thoroughly heated the draft should be cut off only half. Several opinions were given the result of which seemed to be in favor of cutting off the draft, save in the case of clays containing a large percentage of vegetable matter when the open draft method would be the most economical and give the best product.

BRICK TESTING.

By D. J. Christopher, Official Brick Tester, City of Chicago.

The objective points most essential, or sought after in conducting or making brick tests, are those which will give us the best wearing brick of a given clay, as well as a method which will show to the purchaser the best brick in a competitive test, and in my opinion the following are the most practical tests at present, in the order as here named, Abrasion, Absorption and Specific Gravity.

In making the abrasion or "rattler" test care should be taken to use a method which will discriminate between hard, medium and soft brick, showing their true and relative standing as well as their toughness.

The absorption test I believe is a very essential test to the purchaser of brick as well as to each individual maker, as it shows a difference between a well burned brick and one not so well burned, or in other words it will show the different stages of vitrification.

I find that the more dense and the better vitrified a brick is the better the specific gravity, as well as to show the heaviest brick or material which composes the brick. I have seen brick or clay which showed a very good specific gravity and yet they were very poor brick, the fault being that the maker did not know how to treat his clay or burn his brick.

I would advise that the National Brick Manufacturers' Association's present standard rattler and method be used in making the abrasion tests. I would also advise the absorption and specific gravity tests, but shall not state what I think the loss or gain of any of

D. J. CHRISTOPHER.

the above tests should be, as I think that is a matter which should be left open for discussion by and before the convention.

Having made about 2,000 tests in the past two years. these bringing me in contact with most of the paving brick plants of the country, I feel it safe to say that there should be a general standard of tests, this standard to be as high as possible. The aim should be good brick instead of cheap and poor brick, as I believe that by using none but the best brick for paving purposes it will only be a matter of a few years before brick will have become the most popular paving material.

This paper brought out no discussion, and the next in order on the program was taken up, the writer being the first one to present his paper in person to the convention.

PIECE-WORK.

By J. P. Fargo, Streator, Ill.

This important subject has many sides. Too many, I fear, for a man with the limited knowledge that I possess of the art of making brick, under such conditions, to do it justice, and I do not write this thinking that my suggestions will add anything to the common stock of knowledge on the subject matter, but because it is the price I must pay for the privilege of attending this meeting, for our secretary does not know the meaning of the sentence, "I will not." What little experience I have had leads me to believe that a factory properly arranged can make more ware with fewer men, consequently less money, if the work is done by contract, or piece-work, than if done by day labor. I have found that more men can work in a small kiln and not be in each other's way when working by

the piece. They are much more willing to work in a hot kiln and are able to handle much hotter bricks, if you are in a rush for them, if they are getting a price by the thousand. As a rule, if working a certain number of hours at a given price, the average man will handle just as few bricks as he can and hold his job. There are exceptions to this rule, but I think few yards are blessed with the exceptions. There is no place or kind of work that I know of where men can beat the foreman as badly as they can discharging kilns. If there is a laggard in the gang you will usually find him at the head. He will work while the boss is watching him, but as soon as the latter's back is turned he will loosen up on the governor, and the whole force will slow up, if not come to a complete standstill, for the rest of the gang feel (with some justice, I think) that he is getting just as much wages as they are, and they will not do any more work than he does.

I hear some one say, why not discharge such a man? Very well; but you may get a worse one in his place, or not be able to get any at all, and in the meantime your work is not being done. But if they are working by the piece this difficulty quickly adjusts itself, for if there is a man in the gang who is not disposed to do his work, he will have to get down and out, for every man in the gang is a foreman.

There is another point in the day labor that I want to mention, namely, paying all men alike. You can go among any set of workmen and you will find two men working at the same kind of work, and that from natural or physical ability one of them is able to do, and is actually doing, more work for the same money than his weaker brother. Now, the weaker man may be just as willing and is trying just as hard as the other but he is not earning as much for his employer. Should he be paid as much? I think not. Still we do not like to discharge him, when we know he is doing his best. Will not contract, or piece-work, remedy this? I think in a great measure it will.

Some one will say that you cannot get your ware handled by contract with proper care, and that the loss will be greater from breakage. I do not think so. If the men understand that they will be called to account for unnecessary breakage, they will do their work just as carefully as when performed under the day system.

But to accomplish the most efficient and economical results under the piece-work plan a factory should be properly arranged so as to give every man an equal opportunity. An abundance of power—a little surplus will not do any harm, good, up-to-date and well-cared-for machinery, with plenty of kiln room and kilns of uniform size, placed at as nearly equal distances from the machinery as possible, are prime requisites. Machine and kiln floors and the yard should be on level with the car floor, for I have found by experience that we can wheel brick much cheaper down hill than up.

When we are able to comply with these requirements and can get a scale of wages satisfactory to both parties, I venture to say that we shall be able to secure a better satisfied and more intelligent class of help, that the output will be enlarged, and that at the end of the year a factory so run will have made a better showing than under the plan of day labor.

The discussion on this subject evoked a unanimous opinion of the efficiency of piece-work for obviating labor difficulties. A paper by Mr. Sponger of Cissna Park, Ill., on "Tile Draining," should have followed this, but in its absence there was read:

AVOID STRIKES, HOW?

By Melvin L. Emerich, Chicago.

To thoroughly treat this much-mooted subject, which I cannot hope to do within the limited compass of this paper, it becomes first necessary to inquire into the basic cause of strikes.

On the occasion of any labor strike, various and numerous reasons are usually assigned, and these reasons, when the strike is of any importance, are largely discussed by those who merely regard superficially, and who do not concern themselves with the underlying causes of things.

What, then, is the fundamental reason of strikes?

Shorter hours? No, that is merely a transitory manifestation; a question that must ultimately be settled, but which when settled, will not prevent strikes. They will go on just the same, unless the deeper and more potent cause for them be eradicated.

Better pay? Another temporary dispute which is invariably settled after a time, as, in the long run, the question of wage adapts itself to the universal economic law of supply and demand, and if all that labor reasonably required in this respect was granted, strikes would not be measurably abated.

Labor unions, sympathetic strikes, and others for similar causes? Not precisely. There were labor strikes before there were labor unions, and there would be strikes today even if there were no labor unions. However, the strikes at the instigation of labor unions, and the sympathetic strike have their immediate cause in a closer relation to the basic cause of all strikes than either the wage strike or the time strike.

What, then, is the great reason for all strikes? This momentous question can be answered in these words: Lack of confidence.

The absence of that confidence in the employer that should exist among the employed, and the lack of that confidence in his employes that should dominate the mind of the employer, are the fundamental causes of all disagreements between them.

Absolute confidence between the employer and the employed is the ideal industrial condition, and until that condition is attained I fear that labor strikes will never be entirely obviated, but as that condition is approached the number and magnitude of strikes will correspondingly decrease. I am not referring to strikes in the brick trade, but to strikes generally.

In every strike, as in every quarrel, there are usually two sides, but the parties rarely see beyond their own side of the dispute. What is the reason for this limited horizon?

Personal selfishness, of course. Men are all more or less selfish, and this selfishness is the leading human motive, but back of all this is again that lack of confidence which should exist between employer and employed. In whom lies the fault? Naturally with both. Neither take the initiative in the promotion of that harmony that should exist between them. Both are distrustful. Both maintain a position approximating armed resistance toward each other.

But the ideal condition can be brought about, or at least closely approximated. I will venture the assertion that if all the manufacturers present were thoroughly assured that those whom they employ were actuated by fair and considerate motives in their dealings, when vexed subjects were under discussion, that you, the employers, would abandon largely, that mental attitude in which animus toward your opponents is the controlling factor. If this be the case, then, it is not unreasonable to presume that the employed, under like conditions, would experience similar feelings? If both were persuaded, had confidence, in the fairness and consideration of the other, would dispute be entirely avoided? The affirmative answer is obvious.

If this reasoning be correct, and the spirit of confidence and consideration be the thing essential to the averting of labor strikes, how can this long-hoped-for condition be brought about?

The solution that I offer to the problem is this:

Since it is probable that one set of men will more or less rapidly appreciate the mental attitude of another, with whom they are in direct contact, it is to be assumed that if either the employer or the employe assume the proper position, that the other will recognize it and occupy a reciprocal stand.

From whom, then, should the initiative come?

The answer to this seems plain to me. While the men are often unreasonable, the employer is equally so, and the employer is more capable, inasmuch as he is the party of the better trained and more highly developed intellect.

From the man, then, of superior intelligence, let proceed the first move toward the attainment of this desired condition. Believe me, the men will respond. Humanity has quick perception, keen intuition, and unfailing instinct.

Your attitude will be appreciated, and you will be rewarded by your men assuming a corresponding position. Dispute and bickering will be avoided. Your relations with your men will be pleasanter. There will be less friction in your business, and in the end your books will show greater actual profit, besides your being relieved of the strain, mental and physical, which constantly impending trouble carries in its train.

I have superintended a plant for six years, and have endeavored, to the best of my ability, to carry out the ideas that I have here advanced, with the result that my concern's relations with its men have been invariably pleasant. We have never had a strike or any semblance of labor trouble, and I believe that the result has been in every way an advantage to our business. If this should succeed in one case, there is no reason why it should not in another, and I confidently commend the plan as one that has been tested and has succeeded.

The opinions of this paper were strongly opposed by Charles Ridgely of Springfield, who said that he did not believe it was the lack of confidence between the employer and employe that caused strikes. The main difficulty seemed to be to him as to the proper division of the profits arising from the sale of products. He had had 30 years' experience as an employer of labor, and he saw no more hopeful sign for the future avoidance of labor troubles than the recent meeting between the representative heads of labor and capital with a view of drawing up yearly contracts which would settle for that period the wages to be given and received. He believed that the men should be treated with justice, but that it should be justice without vacillation, the justice of a strong arm. He believed with Theodore Roosevelt that the employer should have for his motto "speak softly, but carry a big stick."

A motion of adjournment was made and the association was dismissed, to be convened at 9:30 on the following morning.

THE ANNUAL BANQUET.

On Tuesday evening at 7:30 the sturdy clayworkers filed into the dining room of the Union Hotel to partake of the hospitality of Andrew Harrington and the Purington Co. In one corner of the room was was a mandolin club which kept up a running fire of excellent musical selections, which greatly added to the enjoyment of the evening. After the feasting had reached its termination there followed the usual speeches and toasts. Mayor Bradley related several anecdotes, and he was followed by Charles Burridge, Major R. M. Wood, Mr. Elliott Loy, who toasted "The Ladies;" Charles Ridgely, McHose of Iowa, H. de Joannis, T. A. Randall, Messrs. Plumb, Sutton, Fred R. Jelliff, of the Republican Register, and C. M. Snyder of the C., B. & Q.

The crowning feature of the evening was the call to the floor of Andy Harrington. He was greeted with that jolly fellows' hymn, "He Is a Jolly Good Fellow," and with three cheers. He made several feeling remarks on his endeavor to do an honest business with them and their previous pleasant business relationship, and at last surrendered and sat down as the crowd sang with camp-meeting enthusiasm, "We Believe It Just Now."

The speechmaking concluded with a few witty remarks by Dr. L. S. Lambert, who said he had heard much of the brickmaker and the contractor and much more about the architect, but never a word did he hear of the people who paid for these brick pavements of which there was so much talk.

Wednesday Forenoon.

The meeting was called to order at 10 o'clock, and the first item on the program was

THE SUPERINTENDENT.

By Eben Rogers, Alton, Ill.

The success or failure of a brick plant depends in a great measure upon the selection of the general superintendent. He is virtually the hub of the wheel of the business, and too much care cannot be taken in testing the qualities of this hub before placing the spokes therein. Perfect spokes in a poor hub will not make a rigid wheel. A vehicle with uncertain wheels will not stand the strain of competition. Therefore it is advisable to look well into the make-up of the hub of your industry before you invest too much in the other parts. Be sure that it is not cracked. Your spokes of men, material and appliances may be of the best, but the product of the wheel all depends upon the rigidness and accuracy with which the hub holds these spokes. The tire of finances may be strong and new ones may be easily procured, but they will all be of no avail if the hub is weak.

Many interesting papers have been written upon the duties of the superintendent and it might be of some interest to enter into a brief discussion of the personal characteristics of this man upon whom so much responsibility centers. In the first place, he must be a progressive man, ever on the lookout for new and better methods of handling his business. He must be able to quickly distinguish between new ideas that are practically practical and those that are theoretically practical. Many plants have been ruined by over-conservativeness or old fogeyism, and many have been ruined by attempting to work out a beautiful theory that was far beyond and above the theorist himself. The most successful man will be found working in the happy medium with a keen eye to benefit by the mistakes of his more unfortunate brothers. He must be, in a sense, a leader of men—that is, he must be sympathetic and easily approached. He must have the confidence and good-will of the men under him without becoming too familiar with them. He must know his business thoroughly in every detail and he must prove to the men that he has this knowledge by giving them the benefit of it without fearing that they will come to know more than he does. He must be ever ready to learn by working out new experiments with his men. When a man assumes the position that he knows all there is to know and is afraid to part with his knowledge fearing some one else may become equally efficient with him the time is probably near when he will find that the very man from whom he has withheld information on certain details has worked out a plan for himself that is more practical than the one so carefully guarded. This is liable to cause friction, whereas if they had worked in harmony, the same idea would probably have been developed and passed to the credit of the superintendent with all parties satisfied. He must have energy in abundance, and he must display it in the same abundance with which he has it. Nothing is so contagious as energy unless it is the lack of energy. The energy with which a superintendent addresses his men and goes about his work, will govern the spirit with which they do the work. He, of all men, must keep up the push, whether he feels it or not, as nothing spreads so rapidly among men as the display of that tired feeling in their leader. He must be thorough in everything. This

is equally as valuable as energy. Much time has been lost and many items have been added to the expense account by letting jobs go that just lacked a little of being permanently finished. He must be system itself. The day of guessing is passed. He must know by system what each department and what each man in that department is doing day by day. The amount of time he has to sit down each day and revel in his own thoughts depends upon the amount of system he employs. If he employs a perfect system, he will know exactly where to locate all difficulties, and can speedily apply the remedy. If he has no system he will spend most of his time trying to locate difficulties and many will occur that he will know nothing about until it is almost too late to apply the remedy. If the men know that system is employed to keep track of the amount and quality of the work they perform, they will begin to employ system to increase the amount and improve the quality of their work. The fact that their doings are brought to the notice of the superintendent daily is sufficient incentive for them to do their best, for they know that when men are wanted for better positions, their record will stand for or against their procuring these positions. On the other hand, if there is no system of checking the amount of work done, the men will soon become careless and their ambition will be to do as little as possible and put in full time. In other words—they will become variable speed men, the speed being regulated by the presence or absence of the boss. He must be a man of even temper—at least outwardly. If he is subject to storms of passion he must let them spend their force within himself, for many mistakes have been made in fits of anger that have taken a lifetime or more to remedy. He must be temperate and regular in his habits as this is the only way he can have a clear brain for ten hours daily work, and a clear active brain is a necessity in a good brick yard superintendent.

Last, but not least, he must be free from worry. Worry is the fire that will eat up all his good qualities and replace them with nothing but bad ones. If he finds it necessary to worry he had better place the yard in charge of the man next in command and take a vacation where he can spend the fruits of worry on himself, thus preventing the pest from spreading any further. In general, the best superintendents are those that have spent some years of work and study in the business they are following and have occupied a number of the positions they are superintending. The fact that they have worked up to their present position is sufficient proof that they are progressive, thorough, energetic, industrious and practical. The school of actual experience in working up is of invaluable assistance to him. He gains a knowledge of the details of the business, the handling of the machinery, and the peculiarities of the clays, both in making and in burning, that he can gain in no other way. He also has an advantage in handling his men as he knows the amount of work to be expected from each man having occupied most of the positions himself. The importance of this position is more often underestimated than otherwise, and upon investigation of the numerous failures in the brick business, the cause will be generally found in the improper selection of the hub. There are several brands of hubs on the market, all represented to be first-class for any service, but in buying it will always be well to look carefully for cracks.

Mr. Ridgley of Springfield, presented to the meeting a resolution to the effect that the interest of both manufacturers and users of paving brick would be promoted by the inspection of the brick by competent and disinterested experts at the makers works, and the officers of this association be requested to place this matter before the National association with a view of obtaining some co-operation with the society of municipal engineers for the provision of such inspection. The resolution was adopted unanimously.

BRICK INSPECTION.

By Charles Ridgley, Springfield, Ill.

It goes without saying that if the use of brick for paving purposes is to continue, and endure in competition with asphalt and all of the other materials used for the same purpose, the brick must be in all respects of the best quality that can be made. The material must be of the best. It must be uniform, whether made so by nature or by mixture. It must be ground and molded, dried and burned, in the best possible manner, and before being laid in the street the brick must be carefully sorted and tested. The effort should be to make every brick that goes into the street a good one. To do this will require the utmost care and attention at every stage of the process; and the brick maker will find his interest in a constant and earnest effort to accomplish this, just as the purchaser will contantly scrutinize his ware as it behaves under the conditions of actual service, and demand that it shall be made to meet the duty that is required of it.

There has already been a large amount of time and patient endeavor expended by engineers, and by students and by brick makers, in the effort to determine the criterion by which good paving brick may be judged. It is not necessary for me to recapitulate these, nor to discuss the propriety of the conclusions so far reached. But I wish to say that I think that all of the discussions and investigations and experiments have been in the right direction, and that we may thank the parties who have conducted them for the facts which they have established, and the service which they have done towards making the manufacture of brick a scientific and an accurate process. It is this—and this only—that will enable the business to endure. Assuming, then, that the engineers of both manufacturers and consumers have agreed upon the qualities that are needed to make satisfactory brick, it is evident that some mode of procedure must be adopted, by which it can be determined whether any given sample will meet the requirements. The manufacturers must satisfy themselves on this point, and they must satisfy their customers as well and then both parties must make sure that in a given lot of brick, all of which are made from the same material and by the same process, the sorting has been so done, as to guarantee that all have been properly burned, so as to make them fully fit for the service to be required of them.

To do this will require a careful, skillful and honest inspection. As it is now, in almost every contract specifications are embodied which are intended to secure the service qualities that are desired. It is hardly possible for the officials of all cities and towns, big and little, to be sufficiently expert to decide upon the best specifications to adopt, when there are so many to choose from, and when the city officials and the specifications are both being constantly changed, and while the selection of brick, if not a new duty, is at any rate only an occasional one to the officials. And if the right specifications are adopted it is even harder for the average city official to judge as to whether the brick fully came up to them. The average mayor or alderman or member of a board of public works, holds office for only a limited time. He is not chosen because of his fitness for such duty. The city engineer is of course more at home in it, but his hands are always so full that he cannot give it his personal attention. So it goes to his assistants, who are often not of his own choosing, nor are they fitted for the work by any previous experience or training. The great need in this matter seems to be competent expert inspection. This cannot be done except by persons who have made brickmaking a study, and who have had experience enough to know good brick from bad under varying conditions, and who also know how to apply the necessary tests and to interpret them when made. An inspection by experts may be more severe at times than one by

those inexperienced; but it should be more uniform, and, as it would be likely to secure a better article for the purchaser in the long run, it should be for the good of the trade; and the brick maker, knowing what to expect, would soon find a way to make his wares so that they would not be rejected, and his results would be more satisfactory. Every maker of paving brick should have at his works all of the appliances needed for making complete tests of his brick; and, if the tests of them are made by experts who make a specialty of that kind of work, these men will soon become perfectly familiar with all of the characteristics of not only his wares, but of all of the others to be found in his competitive district. They will know his material and its good and bad qualities. They will know how it should be handled in order to make the best product, and their observations will go not only to the brick as ready for shipment, but will extend to every step in the process, from the quarrying of the shale and the clay to the burning and cooling of the brick and bringing them to be sorted. And they will know what objectionable features they may find it necessary to disregard in order to secure some good points that will more than counterbalance them. In no mechanical process of which I have any knowledge is it possible to make all of the product precisely alike, or so that every piece of it will comply exactly with the specifications. In the manufacture of iron and steel, hardly any two bars are of precisely the same size; the wear of the grooves in the rolls that give them shape, the difference in the heat at which they are finished, and many other causes, make them vary. So in rolling plates. The spring of the rolls, especially if the rolls be long ones and the plate in consequence very wide, will make the plates sensibly thicker in the middle than on the edges. Persons who are familiar with these articles expect this, and know just how far it may go without giving ground for complaint. This is true of brick, as we all know. The sizes will vary from the wear of the dies through which they pass, from a variation in the material, or from the way in which they are burned. The brick may be cut a little out of square, or chipped as they pass through the cutter, or in handling in the dry house or elsewhere. Your competent inspector will know just what store to set by these variations from absolute perfection, and he will not inflict needless loss on the manufacturer by higgling over slight defects, while at the same time he will mercilessly reject everything that will in any material way go to detract from the real value of the pavement when completed. An inspection of the kind herein outlined could be made best of all at the makers' works. It would be better for the purchaser that it should be so made, for the reason that, first of all, it will be made by a specialist who will not only be a judge of the finished brick, but of the materials and their mixture, of which good brick are made composed, and of the processes which go to make good work. Being on the ground, all of these items would be under the observation of the inspector, and the securing of better brick would result.

It would be better for the manufacturer, also, for the reason that, having to deal with inspectors of the same sort, it would soon be easy to determine just what would pass the inspection and what would not. The allowable variations from absolute perfection as set forth in the specifications, would soon come to be well understood, and, perhaps better than all, the final sorting being done at his works, he would be relieved from the irritation and the loss caused by the inspection away from home, with the constant and ever changing requirement that his goods must be made to suit the ideas of people whom he has never seen and with whose judgment he finds himself unable to coincide. Every maker offering brick has had more or less of his brick rejected, not only after they have been shipped away at a considerable cost for freight, but also after they have been hauled onto the street where they were expected to be laid. By the time that the brick are removed from the street and disposed of, the maker is a lucky man if he gets fifty per cent of the price for which they were sold. And this is likely to happen to any works, and at any time. The manager of a going brick works finds so many things to engage his attention that, try as he will, he can not always have his brick sorted as he would do it himself. And it is impossible at times to prevent the loading of some that he would have rejected, had he seen them. The proper way is for both parties to leave this sorting and inspecting to specialists, to have it done at makers' works, and to abide by the inspection. It need not be feared that the inspectors will not do their duty. The same plans have been in use for years by the railroads and the car builders in the purchase of rails and splice bars, and other track fixtures; also in bar iron and bar steel and stuff for bridges and structures of all kinds, and I have yet to learn of a single instance where any purchaser has gone back on the work of an inspector, or where any of the material has failed from any fault which could be attributed to a faulty inspection.

The men who would be sent to inspect brick would naturally have more or less of education and experience as engineers, and it would be strange indeed if they did not sooner or later become very close judges of the article, and if the average quality was not raised by their careful and intelligent selection. The price also could be lowered by the saving that would ensue, and the lack of risk, if all of the culls were left at home, where no expense would be put upon them, and where they could be utilized to the best advantage.

It ought to be possible for the members of this association, by united action to get this matter of inspection at makers' works adopted by the would-be purchasers, and provided for in the terms of every contract, and the subject is hereby presented in the hope that the necessary steps will be taken to secure that end.

WHAT ILLINOIS TILE MANUFACTURERS HAVE DONE.

By C. G. Elliott, C. E., Editor Drainage Journal.

You have met here at the opening of a new year, fresh from your summary of the past years' work; you have smiled over the profits and frowned over the losses revealed as the books were balanced—or had you the courage to keep a smiling face throughout? At any rate you pocketed the net cash along with your discomfiture and have met here together for mutual encouragement and mutual help. Some of you have not only looked back over the one year's work, but your glance has covered the ten, twenty or twenty-five years since you first built your plant. Such retrospective views came naturally with the closing year. But it is possible your backward glance has been too narrow? You have looked, perhaps, only at the cash returns to yourself, and have measured your success by the number of dollars added to your bank account; but it is only just that you should take a broader, kindlier view of what you have accomplished.

For the brickmaker, perhaps, this is not so important. The imposing walls of brick rising skyward, the miles of pavement over which we ride, the beautiful fronts of residences, business blocks and public buildings are all silent but impressive witnesses of the enterprise of the brickmaker. His work shows for itself, and he who runs may read. Not so the tilemaker. The products of his kiln are strung along over field or through bog and finally buried far down out of sight, and it is easy for even the tilemaker himself to fail to realize what he has accomplished. The passer-by views the beautiful brick structure with admiration, but treads the ground above the hidden tile, unconscious even of their presence.

And so it is well for us to pause a moment and recount the achievements of the tile-workers of Illinois.

At the start let us not forget that it was the tilemakers who were largely instrumental in organizing in 1879 the present strong and prosperous association, which I have the honor to address, and it was as the Illinois Tilemakers Association that its deliberations were incorporated in the State Agricultural Reports, because recognized as being in the line of agricultural improvement. The organization of the association at that time marked an epoch in the soil recources of the state. The wealth of unimproved soils so long dormant began to appear. From "Egypt" to the Wisconsin line, could be seen that activity in drainage which was soon rewarded by plethoric granaries and sleek live stock. So great was the land owners' appreciation of tile, and so ready were the tilemakers of the state to respond to the demand that in 1882 there were 500 tile factories operated in the state, which produced, according to the best figures at hand, not less than 20,000 miles of drains, which were laid during that year. The work went on; the tilemakers met in convention, and consulted as to the methods of making better ware and more of it, and also as to the best

C. G. ELLIOTT.

way of disseminating information regarding the use of drain-tile, and it is greatly to their credit that they have had so large a measure of success in both undertakings. Their tile placed on the market today are vastly improved in quality; the burning, though subject to occasional bad luck, is usually excellent, thanks to that skill of the burner which is acquired by long experience. Patient presentation of argument, fact and experience as to the value of tile drainage convinced even the most skeptical, and the absurd ideas held and promulgated by many—including even some civil engineers—that drainage caused floods and drouth and other grievous climatic influences are now wholly repudiated as false and senseless.

In connection with the remarks on the improved quality of the ware, a good word should be said for the machine manufacturers, who have put the shoulder to the wheel, considered every difficulty which confronted the tilemaker, and brought their machines to a highly gratifying state of perfection. The tilemakers have been quick to avail themselves of improved machinery, and the result is a marked improvement in quantity and quality of tile.

With regard to the recent status of the business, it may be said that Illinois leads all the states in the value of its drain-tile product. It has the second largest drain-tile factory in the world, and, notwithstanding what has been accomplished in drainage, still has vast areas of land to be improved. The drains already in operation are yielding annual returns much greater than any investment company will give.

But while the tilemaker has been so successful in the accomplishment of his purpose, and has built up so thriving a business, he has indirectly—and all unconsciously—done much more. No truth has been more fully demonstrated nor its value more sensibly realized than that the soil is the source of all wealth. It is the good fortune of the tilemaker, in the nature of his business, to be the means of liberating the wealth lying unused and unsuspected in the soil. By the way, has it ever occurred to you that the buried wealth in the soil, brought out by underdrainage, is distributed over a much larger territory than any other of the hidden treasures of the earth? Our lead mines, though rich in product, occupy a restricted field. Our coal products are found in paying quantities in comparatively few localities. The supply of stone and sand is by no means inexhaustible in quantity nor widespread in extent. But the wealth of plant food contained in the soil and made available by the action of tile drains is immeasurable in quantity and as widely distributed as the soil itself, and each plot of ground yields up its profit year by year with no intimation of bankruptcy nor shrinkage of values. Thousands of acres have been increased in value 100 per cent, because of the increased productive capacity with which drainage has invested them. Thus the tilemaker, with no imposing mansions or brick blocks to proclaim his work, may feel nevertheless that his is no small part in the economy of life; for upon the successful work of the tilemaker rests largely the development of all clay-working industries, since the wealth which pays for brick blocks, which demands brick pavements and ornamental tiles and decorated building fronts comes originally from the soil and its production is hastened and increased by the silent force of the tile drain. He is a wise brickmaker who, realizing this fact, extends his plant so that he may manufacture tile as well as brick, for the success of all clayworking industries is linked inseparably with that of the tile manufacturers. Do our farms improve and become more productive by drainage, then do our villages and towns erect new edifices and pave their streets.

The work of the tilemaker has placed Illinois in the front rank of food-producing states. It has increased the value of grain lands not less than 30 per cent—to say nothing of the increase in value of town and village property, which represents a portion of the country surplus.

There is another phase of the subject. We at times become weary of the continuous strain after profits. Is material profit all we can claim for this branch of the industry here represented? Has not the work of the tilemakers contributed its share to the intellectual, moral, and aesthetic advancement of our people? Are we not better citizens because of their business? For answer I have but to review conditions with which you are familiar. The improvement of lands, alone, does not make millionaires of cultivators of the soil, but it furnishes independent competence to them. The use of drain-tile has given our people better health, given the young people of our rural communities a good education, has helped to place libraries in homes, improve roads, erect churches, build agricultural colleges, and create a demand for the teachings promulgated in institutes and conventions. Undrained lands and poorly improved lands do not produce these results: they never have. Our people have thus become intelligent citizens, competent to meet all questions of life and government which present themselves. In other words, the use of drain-tile has exercised an important function in developing men in Illinois, and that, after all, is the crowning excellence of all industry. This idea is expressed by the poet:

A word to a restless people in a fast and feverish age:
A perfect manhood is better than any wealth and wage.
Then break up the high, bleak hillside, and trench the swamp and the fen,
For what should the land be fit for, if not for the rearing of men.

This highest office of material success has always followed the reclaiming and draining of land since the art first received atten-

tion. It is remarked by a well-known author, in commenting upon the drainage of the celebrated fens of England, which took place in the early part of the 19th century, that "the civilizing effects of the drainage of these great tracts upon the people immediately concerned are difficult to measure." It is sufficient to say, however, that it had no small part in leading men away from primitive superstitions and rude practices to higher ambitions, nobler impulses, and purer morals. It is said that when the drainage of the North Level, a part of the noted Fens of England, seemed assured one of the Fen poets made the following versified predictions:

With a change of elements suddenly
There shall a change of men and manners be:
Hearts thick and tough as hides shall feel remorse,
And souls of sedges shall understand discourse;
New hands shall learn to work, forget to steal.
New legs shall go to church, new knees shall kneel.

Crude as these predictions are in form, they have been amply fulfilled in spirit. Much finer verse has been written which contained less truth.

Illinois drainage is referred to far and wide as an example of original and progressive work. When the state of Minnesota sought for a drainage law adequate to the needs of her great wheat garden of the world, the Red River Valley, she found it in the Illinois law, and practically incorporated its methods and provisions into the law which is now operating so sucessfully in that state. It was the work in Illinois which demonstrated the practicability of light grades for tile drains, and their use for the improvement of large level tracts of land. England and Canada are learning something from you and are quoting and investigating Illinois practice.

It is furthermore interesting to note that the Department of Agriculture, in accordance with the earnest recommendation of the chief of the division of soils, proposes to make experiments looking to the reclamation of waste irrigated alkali land by the use of tile drainage. The matter has been carefully investigated in the course of the soil survey, by a man who was brought up on the prairies, and educated in Illinois drainage methods and results. He is confident that the most gratifying results will be obtained by the experiments about to be made.

I have recounted some of the achievements of the Illinois tile manufacturers which have incidentally come to them in the line of their business. In the light of what has been done, who has the wisdom to predict what they may yet accomplish. The lamp of experience shines brightly, which fact, without doubt, tends to give all a feeling of self-reliance and confidence in the future. The tilemakers work on the ground floor, so to speak—near to nature's sources of wealth. Their work has to do with the homes of the poor and rich alike, and has been widespread in its results. Let the work be extended until every acre of land in the state shall be capable of producing to its utmost limit, and every home be one of plenty—of luxury indeed. A key which unlocks these goods things is at our command, and, knowing the history of Illinois tilemakers, I hazard nothing in assuming that it will be wisely used.

Mr. Elliott's paper was a finished contribution to clayworking thought and received hearty applause.

The comittee on resolutions then submitted the usual resolutions of thanks to the officers of the association and to those who provided the entertainments at Galesburg.

A further resolution was adopted on behalf of a representative state exhibit to be made at the Louisiana Purchase Exposition in 1903. This subject was dealt with exhaustively during the convention and "Brick" had an opportunity of placing before the clayworkers a resume of its efforts towards the carrying out of a satisfactory representation of the clayworkers of the United States at St. Louis.

The treasurer's report showed $145.70 in the treasury. This was reduced by the passing of the secretary's bills of $61.20, leaving the balance of $84.50. A suggestion was made that a suitable memorial be prepared on the death of Thomas Trainor and sent to his widow.

The officers were then elected with W. S. Purington as president; J. M. Mamer, of Campus, vice-president; G. C. Stoll, of Wheaton, secretary, and William Hammerschmidt, of Lombard, treasurer. Invitations for the next year's meeting were extended from Macomb and Bloomington. The convention then adjourned.

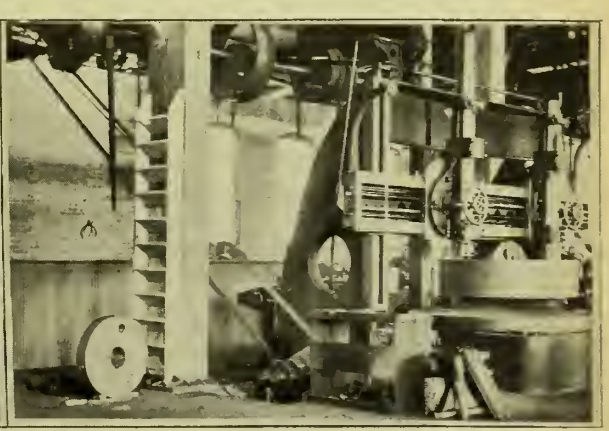
Visit to Two Huge Manufacturing Plants.

The cars were waiting at the square at 12 o'clock to convey the clayworkers to the plant of the Frost Manufacturing Co., which we illustrated in "Brick" a year ago. The clayworkers had the freedom of the house and much interest was expressed at the huge machinery which proved so docile to the touch of the operator. After an extensive survey of all the wonders, the company returned to lunch at the Union Hotel.

At 2 o'clock the clayworkers trekked to East Galesburg by special car and enjoyed the hospitality of the Puringtons which is proverbial. The first visit was paid to the clay banks and the operator of the steam shovel gave a very fine exhibition of his

THE FROST MACHINE SHOP.

W. S. CAMERON.



A 10-FT. BORING MILL.

engineering skill which elicited rounds of applause from the enthusiastic brickmen. One could see a clayworker in every nook and cranny of the plant examining kilns, inspecting machinery and discussing all the methods which they saw here employed. The new Purington kilns, which were first illustrated in "Brick," aroused great admiration and several expressed their belief that they were the finest kilns they had ever seen. During the visit to this plant we secured a photograph of the happy band, which we herewith reproduce.

An exciting feature of this last day was the arrival of January "Brick," which was distributed in all directions, and we were overwhelmed with compliments on its splendid appearance and the excellence of its contents.

The Machine Men at the Convention.

The machine men were all represented at the convention, but several familiar faces were absent.

The Fernholtz Brick Machine Co., of St. Louis, was represented by J. B. Beall, a new face at conventions, but one which will win a deal of confidence and esteem.

Charles Burridge, representing H. Brewer & Co., is a light-house in a world of darkness who, apparently, grows taller than ever and who may be seen at any hour of the day gazing around the assembled crowd counting up the "Brewer" scalps and gloating over prospective victories.

The Simpson Manufacturing Co., of Winthrop Harbor, was represented by J. S. Simpson, who was pleased to announce the great strides made by the company since its removal to new quarters.

The Frost Manufacturing Co., of Galesburg, needs no other representative than the personality of Andrew Harrington, who is a host in himself and who was always surrounded by groups of friendly clayworkers.

The Chicago Brick Machinery Co., Chicago, had two representatives who were the inevitable John J. Maroney, alias "The King of Ireland," and H. D. Hopkins.

G. C. Stoll, of Wheaton, the ubiquitous secretary of the Illinois Clayworkers' Association, propounded the merits of the "Built right and run right" machinery, and the American Clayworking Machinery Co. was also ably represented by Lew Thorn.

The Chambers Bros. Co., of Philadelphia, Pa., was represented by its new western agent, Davis Brown, who takes the place of the late Jesse Eastes.

The Leader Manufacturing Co., of Decatur, Ill., sent into action a capable representative in the person of E. B. Johnson.

Among the kilns were the Swift Furnace Kiln and the American Continuous Kiln, represented respectively by F. E. Swift, of Washington, Ia., and F. W. Heidenrich, of Hedrick, Ia.

The Detroit Brick & Tile Co.

The Detroit Brick & Tile Co. was incorporated Nov. 5, 1901, under the laws of Michigan with a capitalization of $75,000. The prospects for the business of the company are excellent, as there is a scarcity of good brick clay in the vicinity of Detroit. The clay bed is close to the main line of the Michigan Central R. R., and consists of 24½ acres of land. The clay is worked to a depth of 20 ft.; there is also an abundance of water. It is believed that the clay will be eminently adaptable for the manufacture of press brick. The machinery has been placed on the grounds and when placed in operation will give a capacity of 100,000 brick and tile per day. Several special designs in cornice brick and tile roofing will be produced. The cost of the machinery and land was $55,000. The company is now selling its shares at $10 per share and is inviting the attention of a limited number of investors. The company's offices are situated at 909 Hammond Bldg., St. Louis.

Mineral Resources of the United States.

The Department of the Interior has just issued the report of David T. Day, chief of the Division of Mining and Mineral Resources, of the United States Geological Survey, for the year 1900. Our readers are naturally most interested in the statistics relating to structural materials.

Stone.

The increase in the value of the stone product in 1900 was general, but the greatest increase was in limestone. In the order of production Pennsylvania ranks first with product of over $8,000,000; then Vermont, over $4,700,000; New York, over $4,000,000; Ohio, over $3,600,000; Maine, over $2,400,000; Indiana, over $2,300,000; Massachusetts, over $2,100,000, and California, Georgia, Illinois, Maryland, Missouri, New Jersey and Wisconsin each produced more than $1,000,000 worth of stone. The value of roofing slate increased about $140,000, though the average price per square decreased 13 cents to $3.00; and the export trade showed a decline of 30 per cent from 1899. The value of limestone burned also decreased nearly $200,000. Good building stone is found in Cuba, the most extensive quarries being in the outskirts of Havana.

Clays.

The activity in all branches of the clay working industry in 1899 was continued in 1900. Twenty-two states as against twenty-one in 1899 had each an output of clay products valued at more than $1,000,000. The following states, in the order named, produced over 52 per cent of the total output: Ohio, Pennsylvania, New Jersey, Illinois. In 1900 Illinois rose from fifth to fourth place, superseding New York. Ohio produced 19 per cent of the total product. The total number of operating firms in 1900 was 6,375, a decline of nearly 600 from 1899. Every state and territory except Alaska appears in the list of producers of clay products. The value of the brick product decreased somewhat from that of 1899. The value of the pottery products increased about 15 per cent over 1899. Ohio, New Jersey and Pennsylvania, in the order named, produced nearly 77 per cent of the total product, as they did in 1899. The number of pottery firms reporting in 1900 was 561, a decrease of 58 from 1899.

The clay mined and sold by non-manufacturers amounted to over $1,800,000, a gain of about $200,000 over 1899. New Jersey continues to be the leading clay producing state, with Missouri, Pennsylvania, Ohio and Delaware following in order. Clays and clay products valued at over $9,800,000 were imported in 1900, a gain of about $1,000,000 over 1899; and clay wares worth over $1,200,000 were exported in 1900, a gain of over $400,000.

The total product of cement in the United States in 1900 was 17,231,150 barrels, valued at $13,283,581, against 15,520,445 barrels, valued at $12,869,142 in 1899, a gain of 11.02 per cent in amount and 3.06 per cent in value.

The Ogden Sewer Pipe & Clay Co. writes us that it will be pleased to receive catalogs on brick and sewer pipe machinery and supplies.

January 1st the firm of Frank W. Clark & Sons, of Rome, Ky., was succeeded by the Clark Manufacturing Co., which is incorporated under the laws of Kentucky, the stockholders being the members of the old firm. The company has an additional plant at Wheatcraft, and has removed its offices to Moselyville, Ky. The president, F. W. Clark, reports business has been excellent at both plants.

The Last Convention of the Galesburg Clayworkers' Ghosts.

The last of the Illinois conventioners had taken their departure and I was left alone in the hall of the Union Hotel to await my return train to Chicago, due in four hours' time. The hall was in semi-obscurity and silence; the night clerk was not to be seen and the boys were dozing in the cloak room. There was nothing between the door and myself except a group of chairs, piled in the center of the hall for the facilitation of matutinal sweeping. Through the glass door I could make out the trees in the Union Square swinging to and fro in the westerly wind which whispered to them sweet promises of an early spring and the warmth and the showers necessary for the weaving of their verdant robes. And the trees shook their heads coquettishly as though they did not believe half what the wind said, but their children, the branches, who were still young and therefore not so skeptical, rustled vigorously in hopeful and joyous applause.

"Brick!" The familiar tones roused me from a chaotic reverie of reminiscence and my lifted eyes revealed to me the ghost of

THE GHOST APPEARS.

Andrew Campbell, my acquaintance of a year past, whose hapless experiences offered so much pleasure and interest to the "Brick" readers of that time. My chair fell to the floor with a crash as I strode hastily forward to meet him and gripped his hand. "You are a welcome visitor," said I. "I trust that your psychological molecules are in an excellent state of preservation." He disengaged his hand with a slight grimace of pain. "As to my health," said he, with a ghostly twinkle in his eye socket, "I am suffering at present from the grip—which you gave me. You are as impetuous as ever, I fear. You remember our last meeting together? Things of the greatest importance in the ghost world have transpired since then and in return for the faithfulness with which you represented our side of the question at that time, I have been commissioned by the ghosts of Galesburg to call you to attend what will positively be our last convention. However, we have but half an hour before our meeting together and as I happen to be the recording secretary of the affair, I am expected to be there first. There are no cars running and you had better borrow Otway's bicycle; he is asleep and the dead tell no tales. Meet me as soon as you can at Purington's new kiln. Do not fail me. Hurry! Ta-ta."

With a wave of his paw he was gone. For a real lively, active ghost he was a cracker-jack. All previous experiences with his good will and hospitality encouraged me; such an opportunity was not to be lost and in four moments I was whizzing down Main St. with the wind at my back, my camera lashed to the handle bar ready for immediate action. Soon I emerged from the shadow of the houses on each side of the road and here the sky widened and a galaxy of stars came in sight, hovering like huge sparks above the stacks which form the breathing apparatus of the mammoth Purington plant. I doubled my speed and stuck my heels into the pedals, keeping up a perpetual steeplechase over the shadows which fell across my course like country fences. I coasted down the bank, past the office, across the wooden bridge and threw myself off the wheel as I reached the entrance of the driers. Propping the machine against an empty car I turned to meet my friend, who took me affectionately by the arm and led me into the kiln.

"You are in good time," said he; "they will all arrive soon. In the meantime if you have any questions to ask me, ask them now, for this will be the last time we shall ever appear to you. Tonight is the night of our deliverance from the ghost world."

"You surprise me," said I. "This sort of talk is bewildering to the uninitiated. Kindly explain what it is that makes this particular evening so important and what on earth you mean by your deliverance."

"My dear 'Brick,'" said he, seating himself on a barrow in the corner of the kiln. "It is scarcely to be expected that you should be conversant with the ins and outs of a subject that has so long been veiled to aspiring minds by ignorance, lack of opportunity or bitter prejudice; yet, I will endeavor to present to you as clear and brief an exposition as possible of the law which governs the movements of those entities now designated by the much abused term—ghosts. Know, then, that a man is simply a universe of experiences and the sum of these constitute his personality and give to him the place which he occupies in life. Proportion and disproportion of quantity and character determine whether he shall be a genius, a mediocre member of society, or a mere loafer. The accumulation of experiences, however, is always accomplished at the expense of physical perfection and when the wedge of this law's violation is once inserted, successive divergence from the right path is a hammer which drives it further home until the body and the force which has dominated it cleave asunder and death ensues."

"And then what?" I queried.

"When this event occurs the spiritual forces involved, the product of these aggregate experiences, are also divided and are appropriated according to the affinitative capacity of those capable and aspiring enough to receive such forces. It is often the case that entities formed by experiences which have been begun in a track not commonly trod by others cannot be appropriated by others within the immediate circle of his acquaintance and this substance force remains behind to assume shape and countenance as in its last existence and to be recognized and feared as a ghost instead of being welcomed as a possible accrument of power.

"One moment," said I. "You use the phrase 'within the immediate circle of his acquaintance.' Could not these forces be absorbed by those capable and desirous of receiving them, irrespective of distance?"

"Certainly," he replied, "but it is only where the mental concentration of the appropriator and intending recipient are intense and extraordinary. Napoleon appropriated the military psychical entities of millions and Bismarck absorbed a universe of diplomatic forces."

"Briefly then, the Galesburg ghosts are the unappropriated entities of the clayworkers of its past history who have contributed to the rise and success of a city which may undoubtedly be termed the finest child of clay that has ever emerged from the matrix of Mother Earth. No personality up to the present time has appeared of sufficient importance and capacity to absorb us and to give us

by that means that participation in active life which we most desire."

A sudden call to order by three startling raps made me turn short around and great was my surprise to find that the whole kiln was alive with ghosts of all sizes and proportions. It is extremely difficult to tell the age of any ghost. Their appearance is very deceptive; those which at a distance seem young and tender may turn out when closer inspected to be old and tough and the presiding genius of this motley crowd, by every indication, was antique as the ark itself.

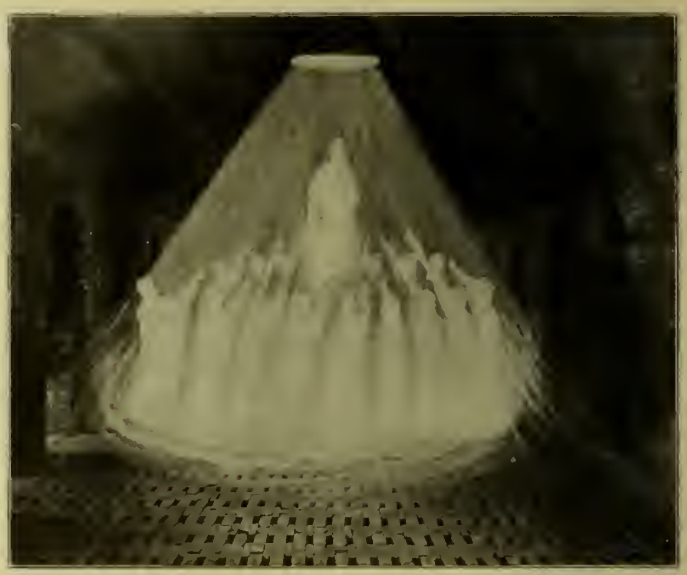
My friend led me gently forward and introduced me to his clayworking, though ghostly, brethren, and we exchanged mutual congratulations and expressions of good will. I also had the privilege of inspecting the so-called president, whose head seemed to be all brow and whose body was all legs. Other raps called us again to order. The proceeding of calling the roll was gone through, each of the ghosts answering to his name with considerable emphasis. It was a rather weird and uncanny scene. The president stood immediately below one of the large crown holes in the center of the kiln. The moonbeams came streaming through it and enveloped him in a pyramid of fire, and the passing of these various figures before him as they answered their names and made obeisance to him, gave a remarkable cinemetographic effect. Next came the address of the president.

"Brethren," said he, "the memory of the last convention held in this city is still fresh in our minds and we recall how many were the difficulties and the hard times through which the clayworkers present at that time had passed. Things have altered mightily since then. On every hand we hear shouts of victory and confidence and this has convinced me that the time is now ripe for our availing ourselves of an unequalled opportunity, a chance in a million years, of a united return to realms of clayworking activity. The law of absorption demands an intelligent direction of the force to be absorbed and also a personality capable in every respect of the appropriation and retention of the forces in question. The unprecedented demand for these products, the tremendous prospect of business activity in the future and the many responsibilities which have fallen upon his shoulders as the result of recent acquisitions of manufacturing capacity have conspired to produce a personality whose aspiration for success in the clayworking art will enable us to carry out release for ourselves and a hundred-fold accession of power for him. At night during sleep the human being is particularly absorptive of forces which are most akin to the aspirations which control him during the day, and the blow which we strike for freedom must be struck now or never. Brethren, I await your pleasure in this matter. We have held many conventions together during these past years, but not in our history has there come before us a question the decision of which involved so much for the future and is of such vital import to us at present."

I had sat all this time intensely interested in the address and the gesticulations of the speaker and many questions were rushing through my mind. He evidently perceived this, for looking at me he said: "Well, tell me what is the difficulty which is uppermost in your mind at the present moment." I rose and replied: "It would seem rather improper for an utter stranger to break in upon such an important meeting as this with so many trivial questions, but the possibility that your plan of absorption may be carried out tonight impels me to ask one question which has always puzzled me. How do you account for the fact that every decade in the past century has shown a remarkable decrease in the belief in ghosts and apparitions in general?"

"My dear 'Brick,'" said he, "this is one of the easiest problems that you could have submitted to us. It is not because you disbelieve in a thing that the thing does not exist, nor is a belief in anything a proof of its existence. In fact in the early part of last century the minds of the people in general were aspiring but not absorptive and there were thousands of entities released by death who were unable to be again taken into the center of the activity which they represented by absorption. It was only when some great man arose to control his day and the destiny of those beneath him that the world realized that there had been an acquisition of forces from some point but it knew not when or how. In every case it was as a result of some such projection as you are now attending. As scientific knowledge increased, however, persons capable of appropriation increased in proportion and year by year there have been less entities unappropriated. The clayworking art has been the last to fall into line but our day is at hand and there is yet to be seen, looming up above his fellow men, some master manufacturer before whom contractors, architects and manufacturers alike will yield undivided allegiance of admiration and respect."

During this reply two or three of these dematerialized clayworkers were occupied in casting a ballot on the question at issue before the meeting and the answer was now made known.



THE GHOSTS DEPART.

"Gentlemen," said the president, "it appears that we are unanimous on this subject and it is now time for us to go." With one accord they turned towards me and a "Farewell, 'Brick,'" was wafted around the walls of the kiln as from a giant megaphone. Each ghost placed his left hand upon his neighbor's right shoulder, their right hands were pointed towards the central figure of the president, who towered above them all. This circle of clayworking forces contracted slowly until all the figures came within the pyramid of fire. The light brightened a hundredfold—the figures disappeared in its glory—then the brightness faded away and naught remained in the kiln but the moonbeams and myself. Beneath the crown hole through which they had vanished I found the object which they had used for a ballot box, which proved to be the dipper used for drinking purposes and which had been abstracted from its place in the boiler room. * * * I am perfectly aware that some critic with iconoclastic axe will attempt to impugn the veracity of the foregoing, but the onus of proof lies with the objector. Time will show, anyhow, and if friend Purington increases in clayworking stature to a remarkable degree or you hear that other acquisitions have been made by the Purington plant the readers of "Brick" will at once be able to trace these happenings to a definite cause.

Improvements at the Steele Plant.

Our readers will be interested in knowing that J. C. Steele & Sons, Statesville, N. C., well known to the trade as the makers of the "New South" brickmaking machinery, have recently erected a new two-story building to be used for finishing and storage rooms, and also a new office building and blacksmith shops. Some ten years ago this firm occupied two frame buildings 30x60 ft.; since

INTERIOR OF STOCK ROOM.

then it has erected five brick buildings and now has nearly 30,000 sq. ft. of floor space.

The Steele plant is one of the best equipped machine shops in North Carolina, and the entire year round employs a large force of machinists and molders.

This firm now makes almost any machinery necessary for stiff-mud brick plants of from 12 to 50 thousand capacity per day. A special study has been made of machinery for working southern clays, and with gratifying success. For making end cut bricks

OFFICE OF J. C. STEELE & SONS.

they have adopted the single die, and single stream cutting table, and have been enabled to work clays by this process that could not be worked on auger machine in any other way. Almost any kind of brick machine will work soft plastic clay, but a good machine is required to work the more obstinate clay, so much of which is found in the South.

Clarence M. Steele is the general superintendent and with the assistance of A. P. Steele, who is a mechanical engineer, is continually at work on new machinery and appliances, and thus keep their machinery abreast of the times.

H. O. Steele is sales manager, and with the assistance of F. F. Steele and J. H. Rockwell, has charge of office. The firm's trade now extends throughout the South, and many shipments of machinery are sent West as well as some to the North. Their trade has increased every year, and the outlook for the coming season is very promising.

"Cling Surface" and a Fine Belt Service.

One of the weakest parts of a brick plant lies in its belts. They are a source of never-ending trouble and loss. Belts under usual conditions must be run tight to give the required power, because any relaxation of tightening stress causes loss by slipping. To prevent this belt dressings are used.

"Cling-Surface" is a preparation designed to meet the requirements on correct lines. It is a belt filler and a preservative. Applied to a leather or cotton belt it penetrates and leaves the belt surface clean—not sticky. But the belt will not thereafter slip. The surface can be kept as clean as a new belt. It clings to the pulley without sticking to the surface and requires no power whatever to free the belt as it leaves the pulleys. Because slipping is entirely and permanently prevented the belt can be run easy or

SHOWING THE EFFECT OF "CLING-SURFACE" ON BELTING.

slack, and yet will transmit more load than when run tight because it never slips and will have an increased arc of contact on pulleys.

Relief of tightening stress means longer life to the belt, no heating or grinding of bearings, less oil needed on bearings, no stoppages to take-up belts, and no running off.

The effect of "Cling-Surface" which penetrates is to make the belt pliable, elastic and waterproof, preserving it and easily doubling its life. "Cling-Surface" also gives the best of results on rubber belts.

The belts shown are in the Homestead Works of the Carnegie Steel Co., after 18 months' use of the compound.

The foregoing claims of the manufacturer it guarantees, and it will supply a trial package to any brick maker for testing, which he need keep and buy only if the results are satisfactory to him. The company reports many good friends of "Cling-Surface" in the brick trade.

The Empire Sewer Pipe Works, of Empire, O., shut down about January 1st because of the scarcity of cars.

The Myers Fire Clay Co., of Toronto, O., which purchased 12 acres of ground from the Stewart heirs for a sewer pipe plant, has bought 216 acres of clay and coal land adjoining it from John P. Cochran for $12,500, and has started to open its mines.

Pottery News.

The Scott Pottery Co., at Cincinnati, Ohio, whose plant has been shut down for some time past, is to resume operations in the near future; extensive improvements are to be made.

There is some talk of reorganizing the Warren Pottery & Clay-Manufacturing Co., which has been out of business since a year ago. There is fine deposit of suitable clay near the old factory; the clay lies only 3 ft. under the surface and is about 5 ft. deep.

The Thomas China Co. has begun operations in its new pottery at Lisbon, O. The plant has started up in all departments and ware is now coming through the glost kilns.

The Vance Faience Co., of Tiltonville, O., is getting its plant into running order for turning out large quantities of art ware. A new packing department has been erected at a net cost of over $3,000, and many additions and improvements and repairs made throughout. This plant has been idle for the last three or four years and was formerly a sanitary pottery operated under the name of the Western Sanitary Ware Co. The plant was purchased by the new concern with the intention of turning out some of the nicest art ware on the market and it looks as if they were about to do it. There are only three or four potteries in the United States making this class of ware—the Rookwood Pottery, Vance Faience Co., S. A. Weller and J. B. Owens, the two latter in Zanesville, O. The Vance company has in this a plant which is composed of three kilns and when running in full in every department will employ in the neighborhood of 150 men.

It is announced that the capacity of the new pottery recently erected in New Castle, Pa., will be doubled in the coming spring.

Orders have been unusually good for the Bradshaw China Co., whose pottery is located in Niles, O. E. S. Bradshaw recently said that they would enlarge the plant at once and that a new double decorating kiln would be put up at once. This pottery makes dinner ware only.

A deal is on whereby the Ohio China Co's. pottery at East Palestine is to be sold in the near future. The Ohio China company is owned by the Sebring Brothers, who own and operate several plants in Sebring, O. It is announced that they will build another pottery in their own town sometime in the next year.

A new electric light plant has been put in at the Chelsea China Co's. plant at New Cumberland, W. Va. The plant is not in operation as yet, owing to some slight changes that have become necessary about the dynamos.

The capital stock of the Summit China Co., at Akron, O., has been increased from $50,000, to $100,000. This pottery was the first to attempt the use of the downdraft kiln for burning pottery. Announcements have been made that the pottery will be increased in size soon.

The Trent Tiling Co., of Trenton, N. J., has broken ground for a series of buildings which will enable it to double its present capacity and increase its output to over 4,000,000 feet of tiling per annum. Four new kilns will be built and the buildings will also be enlarged enough to accommodate the increase. The additions are to be completed by April 1st.

The National China Co., of East Liverpool, O., was recently damaged by fire to the extent of $500.

Negotiations are pending between the Bell Pottery Co. and Columbus capitalists which may result in the erection of a ten or twelve-kiln pottery at Columbus. The present plan is to form a company with a capital stock of $500,000.

There is some talk of a pottery being built at Youngstown, O., but who the parties are who are interested is not definitely known.

S. J. Scott, formerly with the Geo. Scott's Son's Co., pottery, at Cincinnati, O., is now with the Zanesville Art Pottery as manager.

The Dresden Pottery Co., at East Liverpool, O., is erecting two new kilns. There will be no new buildings built, as all the improvements of this kind were made when the works were rebuilt after being burned down some months ago.

The Unionport Pottery Co., of Unionport, N. Y., is putting some new machines in the clay shops.

Notice has been received of the contemplated removal of the Turley Pottery from Danville to Burlington, Ia. The firm makes stoneware.

The Muskingum Stoneware Co., of Zanesville, O., has been sold to J. F. Weaver, of Roseville.

The report comes from Anna, Ill., that J. L. Toler, of the Anna Pottery Co., has purchased the pottery owned by the Lone Star Pottery Co., at Winsboro, Tex.

The Maddock Pottery Co. has been incorporated at Trenton, N. J. The firm was formerly known as John Maddock & Sons, and made a new ware, the body of which is composed of bone china.

The new Barberton (O.) Pottery Co. will be the only fire-proof pottery in the world.

Ohio Ceramic Busy.

A recent visit paid by a representative of "Brick" found the Ohio Ceramic Engineering Co., of Cleveland, busily engaged in making up a stock of presses and cars for the spring trade. The company had a very satisfactory year in 1901 and expects to do a good business this year. This company has been in business in Cleveland for five years. Mr. Robinson, the president, says the order for power tools was placed in the evening of the day Mr. McKinley was first elected president, and that the man who placed the order was an ardent free silverite. Some of them thought the first year that prosperity was a long time on the way, but it struck them last year without doubt. The first machine placed on the market was the Richardson repress, and it is still first in the "affections" of the brickmaker apparently, for last year the company sold five times as many as during the first year. About a year ago steel drier cars were added to the line, and sold more last year than was expected. To quote the company: "Our competitors are nice fellows and have good cars, but when the brick men come to Cleveland in February to the convention, we will show them some cars that will make them wish they had not bought so soon. We are not proud of ourselves, nor of our factory, but we do think a 'heap' of our cars and presses. We have sold four represses so far this month and a good line of cars."

New Michigan Company.

Parties from Jackson have gained control of clay lands at Britton, Lenairee County, Mich., for the purpose of manufacturing all kinds of clay products. We understand that they control one of the finest beds of clay in the state, which also has a very advantageous location—within a very short distance of the junction of the Wabash, Detroit & Lima Northern and the Cincinnati Northern railroads.

J. G. Dean, chemist for the Peninsula Portland Cement Co., of Cement City, Mich., is interested.

Cruger & Dace, the largest brick manufacturersin southwest Georgia, will soon begin rebuilding their plant at Albany, Ga., and will install a complete and modern equipment of brickmaking machinery. The present output of 10,000,000 brick per year will be practically doubled.

Iowa Clayworkers' Association.

The 22nd Annual Convention, Held at Des Moines, January 22-23, 1902.

The 22d convention of the Iowa Clayworkers' Association was admittedly the most successful one that the association has ever held—the attendance was larger than ever before and the papers were particularly interesting and valuable. The headquarters were at the Kirkwood Hotel, Des Moines, when the first session was called to order at 10:45 a. m. on January 22d.

The roll call showed the following members represented:

H. Brewer & Co., Tecumseh, Mich., represented by Chas. Burridge and Omer Smith; F. W. Heidenrich, Hedrick, Ia.; C. W. Raymond & Co., Dayton, O.; G. M. Raymond, Topeka, Kan.; S. E. Bentley, Tama, Ia.; C. J. Holmes, Sargents Bluffs, Ia.; Chambers Bros., represented by D. Brown; Dunlap Manufacturing Co., Bloomington, Ill., represented by Mr. Search; American Clay Working Co., Bucyrus, O., represented by F. H. Coble; "Brick," represented by H. de Joannis; E. J. Smith, North English, Ia.; Wm. Sutton, Table Rock, Neb.; C. E. Shaw, Iowa Falls, Ia.; M. Newcomb, Corning, Ia.; Iowa Pipe & Tile Co., Des Moines, Ia.; D. G. Spenner, Afton, Ia.; M. C. Bridenstine, Tiffin, Ia.; C. Green, Dennison, Ia.; M. Joeston, Sioux City, Ia.; F. C. Mullinnix, Leon, Ia.; Ft. Dodge Brick & Tile Co., Ft. Dodge, Ia.; H. R. A. C. Heath, Lehigh, Ia.; F. E. Swift, Washington, Ia.; H. S. Swift, Riverside, Ia.; Geo. H. Kettell, Tipton, Ia.; Robert Goodwin, jr., Redfield, Ia.; W. W. Lewis Williamsburg, Ia.; David McAllister, Newton, Ia.; S. J. Harris, Adel, Ia.; Thomas Goodwin, Grand Junction, Ia.; George Siegel, Oceola, Ia.; S. McHose, Grinnell, Ia.; J. E. Chamberlain, Minburn, Ia.; Leader Manufacturing Co., Decatur, Ill.; H. H. Hood, Jewett Junction, Ia.; W. D. Simon, Jamaica, Ia.; J. W. Darley, Greenfield, Ia.; H. E. Nelson, Dayton, Ia.; G. A. Wild, Cedar Falls, Ia.; F. E. Snyder, Jewett, Ia.; Clay Record, represented by G. H. Hartwell; J. B. McHose, Boone, Ia.; Robert Goodwin, Des Moines, Ia.; C. E. McHose, Boone, Ia.; J. A. Conger, Goldfield, Ia.; H. H. McHose, Grinnell, Ia.; Geo. J. Bailey, LeHigh, Ia.; Chas. B. Ebert, Pittsburg, Pa.; F. E. Martin, New Sharon, Ia.; F. A. Younkin, New Sharon, Ia.; American Iron Works, Des Moines, Ia., represented by W. E. Hamilton; Eagle Iron Works, Des Moines, Ia.; Des Moines Manufacturing & Supply Co., Des Moines, Ia.; J. S. Raney, Fairfield, Ia.; H. F. Zartmen, Sioux Rapids, Ia.; C. A. Tramp, Audabon, Ia.; Madden & Co., Rushville, Ind.; S. C. Beasley, Council Bluffs, Ia.; C. M. McHose, Nevada, Ia.; F. A. Stephenson, Mason City, Ia.; Iowa Brick Mfg. Co., Des Moines, Ia.; W. E. Berry, Guthrie Center, Ia.; D. W. Stookey, Cedar Rapids, Ia.; Platt Press Brick Co., VanMeter, Ia.; G. W. Dennison, Mason City, Ia.; D. T. Morey, Ottumwa, Ia.; Arthur McHose, Grinnell, Ia.; G. M. S. Peterson, Cumberland, Ia.; A. C. Zartmen, Jamaica, Ia.; C. H. Newby, Lynnville, Ia.; Carl E. Bechtel, Des Moines, Ia.; Straight Bros., Fonda, Ia.; Straight & Campbell, Leigh, Ia.; I. A. Williams, Ames, Ia.; C. F. Kaul, Madison, Neb.; St. Louis Hydraulic Press Brick Co., represented by G. H. Emery, Omaha, Neb.; Dale Bros., Des Moines, Ia.; Capital City Brick & Pipe Co., Des Moines, Ia., represented by J. McGorrish; J. C. Mardis, Des Moines, Ia.; M. Kissick & Kiles, DeSota, Ia.; Des Moines Clay Manufacturing Co.

Next on the program was the report from these clayworkers and this was a series of statements, unanimous as to good sales, good times, good prices and low stocks. It was great pleasure to note the confidence that each man had in his future, and also the satisfaction with which he compared his testimony at the last convention held in Des Moines some years ago, during the general depression of trade, with that which he was now able to give.

A committee on resolutions was appointed with C. J. Holman, of Sargents Bluffs, as chairman. Many new faces were observed and these also, some of them quite new to the business, glowed with the prospect of a brilliant future for their brickmaking ventures.

The Globe Machinery & Supply Co., of Des Moines, Ia., made a generous offer to the association to take them all to Foster's Theatre that evening, to witness the performance of "Rip Van Winkle" by Matthew Jefferson. This offer was accepted unanimously and the convention adjourned at 11:45.

Wednesday Afternoon.

At 2:45 the convention was called to order and a discussion led by J. B. McHose, of Boone, Ia., was opened on "Better Drainage Laws." The gist of the remarks was to the effect that there was no doubt whatever that Iowa need better drainage laws. Where two farms joined the man who owned the upper land had no outlet for his drainage unless his neighbor permitted him to tunnel his tiling through the latter's land. This permission in nearly every case it was impossible to obtain and brought all tiling matters to a standstill. Under the present drainage laws and a decision of the Supreme Court it is clearly set forth that no one can be allowed to take private property for private use even if the taker should be willing to pay for all damages done. Thus, if the farmer who lived on the upper land and who is essentially progressive in his ideas is perfectly willing to tile the whole of his farm and convey the drainage thereof from his land over his neighbor's land and is willing to pay for all the work done through his neighbor's land and to replace that land in the same condition as he found it with the tile underneath it, there is no law that will aid him to do so, the contention being that this would be taking private property for private use. It was contended by several of the subsequent speakers that the decision of the Supreme Court was erroneous in its conclusions, and that far from its being a private question it was a question which was extremely far reaching and involved the betterment of not only the first farmer's land but contributed materially to the enrichment of the land over which the drainage tile passed. It added also to the general purification of the district and the value of tile drainage had now become so generally recognized that the question should be considered as one of public benefit and interest and every layer of drain tile in any land should be considered as a benefactor to his country and state. There is no law in existence which would aid the progressive farmer to carry out his principles and a movement should be at once set on foot to secure laws which would meet with all objections and which would provide a satisfactory basis of agreement between the various land owners.

Among other things it was proposed that the man who owned the land through which this tile passed should be forced to contribute a proportion of the expense of tiling through his land inasmuch as it was bound to be of positive benefit to that land notwithstanding the fact that he himself was not prepared to tile it. The whole matter was placed in the hands of the committee on resolutions.

Then followed the address of the president, G. A. Wild, of Cedar Falls:

PRESIDENT'S ADDRESS.

In the history of our association this is the twenty-second time we are assembled as a body of clayworkers. Our object in meeting is to discuss problems of interest and vital importance to our calling, to gather new ideas for conducting our business, to meet and shake hands with those we have met in former conventions,

and I hope that we will find many here, who have come to us for the first time, that we will be privileged to make many new acquaintances and add largely to the roll of our membership. The place of our meeting will certainly bring back to our older members the days when our association was not as strong as it is at present and when it meant a great deal of work and push to hold together the members as an organization, and still many of us can recall many pleasant hours that were spent very profitably at the past clayworkers' conventions held in the city of Des Moines.

It is true at one time we felt that we must leave this city and hold our conventions in other cities, which was done and our association is none the worse for it at this time. In holding our meeting here this year we feel as though we were again at home and your president hopes that no mistake was made in our choice of the place, and now let us put forth every effort to make this session one of great benefit and interest to us all.

Conventions can be of benefit to all members only when each one takes a personal interest in the proceedings and takes part in the discussion of the various topics. Let none think that it requires a long standing membership to become an active member, let no one hesitate to express his views or relate to the convention his experience relative to the particular work under discussion. We have all come for the advancement of our business and there is not one among us who is not willing to pick up some idea that has been found beneficial to others.

Clayworkers have a peculiar calling, different from all others in many respects. While in a general way we are able to define the different methods of making brick into three different classes, there are but few among us who are able to produce from two apparently similar clays the same quality of ware by applying the same process in the manufacture of both. Clays must be studied. That brick or tile manufacturer who thinks he knows all about his clay and that of his competitor is a wise man, at least in his own estimation, but I think men of such wisdom are not very numerous, even in our great and enlightened state of Iowa. Hence we are here to learn and desire to take home with us new ideas relative to the manufacture and sale of clay products, as expressed by our co-workers.

The past year has certainly been one of great prosperity to the country at large and the clayworker has undoubtedly reaped his share of the profits and feels happy and contented. Perhaps never in the history of our country have we been able to record such a large volume and growth of business as has been our privilege in the closing days of 1901. In different localities the demand for brick and tile far exceeded the supply and while plants and yards run to the limit of their capacities, they were even then unable to fill all orders. Such conditions are very desirable from our standpoint as manufacturers and should be considered as the realization of our most sanguine dreams of the past. Whatever the prime factor or original causes for the existing conditions may be, we all should recognize that we have reasons to be thankful.

When the brick or tile manufacturer receives more orders than he is able to fill, then there is a time when he is tempted to raise the price of his wares, desirous of realizing larger profits, knowing well that his customers must pay the price. This may be a good business policy and is, perhaps, endorsed by a large number of our members. Still we ought to consider well before we raise the price of our wares above that point which gives us a good legitimate profit. Let us be cautious. Let us consider well the conditions existing in our territory and let us not forget that a very high price on brick or tile not only may prohibit the use of the same on a large contemplated improvement, but at the same time invites competition. Lumber is high and there are many good reasons for its being sold at a high figure, in fact, the time is not far distant when the price of lumber must be raised still higher. It is our duty to encourage the use of clay products for building purposes and therefore we must not lose sight of the fact that our price must be so adjusted that brick or tiling will take the place of lumber.

The uses of brick should be multiplied. No material will stand climatic erosion as well as brick. Its durability as building and paving material cannot be surpassed. In view of this fact it is our urgent duty to do some educational work along this line among the general public. Clayworkers must get hold of the spirit of other trades. What might be termed political work is one of the essentials of a large brickmaking concern of the present day. By the use of tact and proper methods with our architects, city engineers, city councils and other similar bodies, much might be accomplished to induce cities and towns to use brick in place of inferior materials in the construction of municipal improvements. However, the methods employed for this purpose must be honorable and in no wise reflect upon our characters. We can all be instrumental in inducing individuals and communities to use our products on a larger scale, if we never let an opportunity pass to speak a good word for clay wares.

The fact that the past season has been a prosperous one to most of us will induce many to enlarge their plants. In so doing they will be able to take care of more orders and have larger profits at the end of the season. This is perfectly in line with sound business principles. In addition to the enlarging of factories, many new ones with large capacities will probably be built during the coming season, requiring large expenditures of money. We are a growing state, consequently industries must grow is size as well as in numbers. There is danger, however, in overdoing.

It is true we have no cause to be alarmed at present, there is not one single reliable sign today that we are again on the verge of hard times. I speak of this matter with considerable hesitation, knowing that no dark cloud appears before the commercial horizon to even indicate the advance of a coming storm, and yet I feel as though I ought to speak a word of warning to those who contemplate very large improvements. It is not my purpose to discourage such improvements which will be founded on good sound business principles. Prospective plants with a large amount of excellent clay, large territory and good shipping facilities should be built and there can be no reasons why such plants cannot do well and pay dividends, if properly managed. But there are at times plants contemplated with only promoters and men of capital with no intimate knowledge of the clayworking industry back of them. The latter as well as the former are in it for money, although quite different as to methods of getting the same. After such plants are built and hard times should come, there is bound to be a crash and as a usual thing the promoter has the money and the capitalist the experience. Let us not forget the lessons the years of 1892 and 1893 have taught us and let us profit by the same.

This convention might take up the work of creating a standard size for building brick. At present each locality has its own size and one can find brick measuring scant 8 in. long and 2 in. thick to a brick nearly 9 in. long and fully 2½ in. thick. Let us try and see if we cannot agree on a size that will serve as a standard and that we can recommend to every brickmaker in the state.

The program to be given will again be greatly enhanced by the different papers to be read here by the professors of the State Agricultural College of Ames and our organization is very much indebted to the latter for their hearty co-operation. I am sure we all appreciate their efforts and in order to give our thanks tangible shape, every one of our members should use his influence and persuasive powers with his respective senator and representative, impressing him of the benefits we clayworkers will derive from the special department of the school at Ames and urging him to give

it liberal support, so that it may in time rank second to none. A resolution, properly framed, endorsing the work of the school at Ames and setting forth in unmistakable terms what we would like to have our legislature do, should be passed by this organization and be presented to the upper and lower house.

Now let us do our work here in a social spirit, that the hours may not only be of benefit to us but that we may always look back upon them with memories of pleasure as well as profit.

Next on the program was:

ORIGIN, CLASSIFICATION AND DISTRIBUTION OF IOWA CLAYS.

By Prof. S. W. Beyer, Ames, Ia.

The word clay as ordinarily used is applied to a substance of indefinite chemical and mineralogical composition and physical constitution. It is the mechanical mixture commonly used in the manufacture of various clay wares. Owing to a certain property of particles to adhere when some water is added, known as plasticity, this composite substance may be kneaded and worked into various forms and shapes which are retained through the subsequent processes of drying and burning. Hence its value in the industrial arts.

Origin of Clay.

All clay has its origin directly in the breaking down of other rocks either igneous or sedimentary, but as sedimentary rocks originate through the decomposition of igneous rocks, it may be said that ultimately all clay has been derived from the weathering of igneous rocks. On close analysis, the igneous rocks may be observed to be composed of two or more minerals, by far the most common and important of which are the silicates; silica, combined with such metals as aluminum, iron, calcium, magnesium, and the alkalies potash and soda. According to Prestwich it is estimated that silica, alumina, lime, magnesia, the iron oxides and the alkalies comprise 96.5 per cent of the known portion of the earth's crust, of which the first two, silica and alumina, constitute 53 and 19 per cent respectively. Mineralogically, according to the same authority, the known crust is made up of 48 parts feldspar, 35 parts quartz, 8 parts mica and 5 parts talc. All of the other minerals comprising but 4 parts of the total. It is to the breaking down of the feldspar and the mica which enter so extensively into the composition of the earth's crust, from which clays are largely derived. The decomposition product of these two minerals constitute the socalled clay substance, which is in large measure responsible for the plasticity which is such an important factor in determining the workability of the clay. Ordinary feldspar contains about 65 per cent of silica, 18 per cent of alumina and 17 per cent of potash, and is a stable mineral, when deeply buried and protected from the atmosphere, conditions similar to those under which it was formed. When subjected to atmospheric conditions, feldspar is not a stable compound. Chemically it loses its potash and a large portion of its silica and takes up water which the chemists call water of crystallization. The resultant decomposition product by this exchange becomes greatly richer in alumina and poorer in silica. When the process reaches completion the potash is wholly withdrawn. The new mineral formed is stable under surface conditions and has the approximate composition of 40 per cent alumina, 46 silica, and 14 per cent water, and is known as kaolin or kaolinite. Practically all kaolin comes from the decomposition of the feldspar. Kaolin is the basis of all clays. Ordinary clays when subjected to a mechanical examination are found to be composed of clay base or kaolin, free silcia in the form of fine sand, and lesser amounts of lime, magnesia, the iron oxides, alkalies and organic matter.

Classification and Mode of Accumulation.

A number of schemes of doubtful utility to the practical clay worker have been proposed for the classification of clays. Prof. Edward Orton in his work on the clays of Ohio divided all clays into "high grade clays" and "low grade clays." These were further subdivided, in part according to their physical-chemical constitution but more largely according to the uses to which they are put, for example, China clay, porcelain clay, tile clays, brick clays, etc.

Some years later Prof. H. A. Wheeler in his "Clays of Missouri" proposed a still more heterogeneous classification, depending primarily upon their physical properties, and secondarily upon their uses. Both the classifications of Orton and Wheeler were attempts to meet the needs of the clay manufacturers. Classifications based upon use can scarcely prove otherwise than unsatisfactory and unpractical. It would be illogical indeed to attempt to classify building stones according to the uses to which they are put. Certain clays may be used for a multitude of purposes and when mixed with other clays the variety of uses may be multiplied greatly.

Later classifications have been proposed by Drs. Ladd and Buckley, based upon position and origin. Buckley's classification

S. W. BEYER.

is believed to be nearest up to date and is based primarily upon the position of the deposits, and secondarily upon their genesis. In the preliminary consideration of the Iowa clays it seems advisable to follow the best classification thus far proposed rather than to add to the confusion by submitting a new classificaion of doubtful utility. In the present paper Buckley's classification, slightly rearranged, has been followed.

When igneous rocks disintegrate in place accompanied by little removal save of the soluble salts by solution, those rocks rich in feldspar and the micas give a kaolinite residuum, admixed with irregular quartz grains and grains of other refractory minerals. These are the high-grade china clays so important in New York, New Jersey, Delaware, Maryland and in other states where igneous rocks are abundant and have long been exposed to the weather. The grit in such clays must be removed by a process of settling or slumming. Other igneous rocks, and sedimentaries which originally come from igneous rocks, when broken down by weathering agencies, may yield a clayey residuum which is of much less importance than the preceding. In both cases the clay derivitives may be designated as residual. Iowa possesses no residual clays of consequence. The "geest" of northeastern Iowa in the driftless area belongs here.

Opposed to the clay which occurs as a residuum in the breaking down of rocks, by far the larger portion of the disintegrated

material is removed in the process, and it is to this group that most of the Iowa clay belong. Such clays may be designated transported, following the terminology of Ladd and Buckley. As to the agency instrumental in the removal, transported clays may be grouped as follows:

A. Water.—(1) Stream. (2) Lacustrine. (3) Marine.

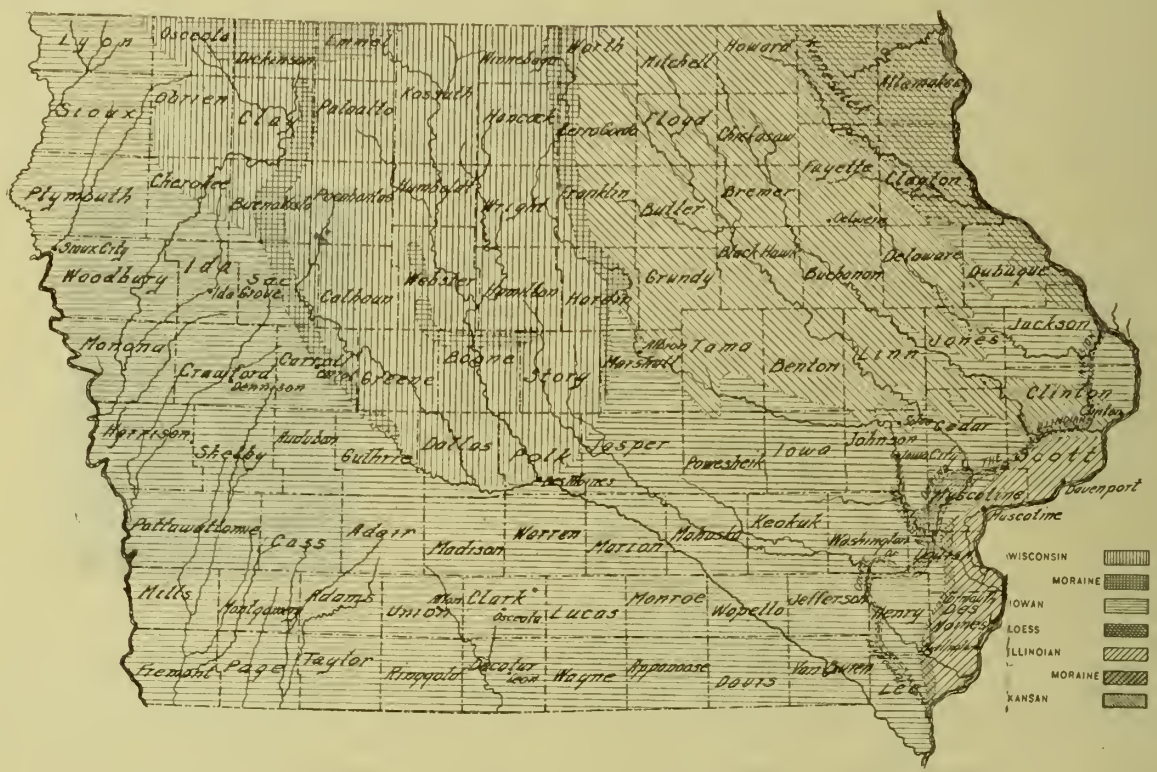
B. Gravity assisted by water.—Deposits near the heads and along the slopes of ravines.

C. Iee.—Deposits resulting mainly from the melting of the iee of the glacial epoch.

D. Wind.—Loess.

Clays and clay shales deposited by water arc the most important so far as the clay industries of Iowa are concerned. The process of rock-weathering involves the sub-processes of rock-breaking which is mechanical, rock decay which is chemical, and transportatioin or removal of the disintegrated portion and the correlative process of sedimentation or the deposition of this rock debris. The most favorable conditions for rock breaking are bare rocks, steep slopes, abundant rainfall with scanty vegetation, and rapid changes in temperature; and for rock decay: gentle slopes, soluble rock constituents, porous soil, and an abundance of water armed with solvents. In the first case the residuum is of mixed mineralogical composition, while in the second the soluble constituents have been withdrawn and a residuum of uniform mineral-chemical composition remains. Seldom are the conditions ideal for the one or the other of these sub-processes. The rule is that both processes go on together, while sometimes one and sometimes the other is in the aseendancy. Weathering progresses most rapidly; other things being equal, on the salient features of the earth's crust. The disintegrated portions, whether by rock breaking or rock decay, are in part sometimes wholly transferred, generally to lower levels. The chief transporting agencies are water in its various forms, the wind, and gravity assisted by water. Of these the most important is water and the general tendency is to reduce the high places and fill up the low places—a leveling process which, if uninterrupted, would eventually reduce the earth's surface to a common level, while the local effect may be to accentuate the surfaee inequalities as is evideneed by the rapid cutting of gullies, gorges and canyons by our streams.

The transferenee of material by moving water in the form of streams, waves and tides is always to lower levels. The carrying power of a stream is wholly dependent upon its velocity, which in turn is conditioned by grade and volume of water. A slight inerease in velocity greatly increases its capacity to carry, while a corresponding decrease lessens it. Thus a stream fully loaded with sediment under a certain velocity must give up a portion of its load when 'ts velocity is checked even if very slightly, as on entering the sea, or a lake, or pond, or because of reduced grade in its own course. These sediments are dropped or deposited in the direct order of their size, largest first, and the smaller and smaller particles successively, while the smallest particles may remain in suspension in fresh water even when still for a considerable time, as any one can prove by stirring clay into ordinary well water and allowing to stand. A vessel of Missouri river water taken at random might serve the same purpose. The precipitation of these fine particles is hastened when fresh water carrying sediment enters a salt water body. The salt affects the surfaee tension which permits the minute particles to rush together or floeculate when they are summarily precipitated. It is due to the presence of these salts that waters in the form of springs and streams issuing from limestone regions are noted for their crystal clearness while the streams coming from the coal measures are characteristically murky and dull. Enough has been said to show that moving water is an efficient carrying and distributing agent of rock debris originating from the high land areas and depositing over the lower areas. Such deposits are often classified according to position as alluvial or floor plain, delta, lacustrine or marine, according to whether they accumulated along streams in deltas,



DRIFT SHEETS OF IOWA—IOWA GEOLOGICAL SURVEY—SAMUEL CALVIN, DIRECTOR.

lakes and seas respectively, and for present purposes may further be separated according to size of particles into gravel, coarse sand, sand, fine sand, silt and clay. The fine sand, sand silt and clay are of especial interest to the brickmaker. The carrying and distributing powers of streams are not constant throughout the year or when one series of years are compared with another, so that where clays are being deposited today sands and silts may follow tomorrow because of a slight increase in current velocity and the next day the recurrence of clays directly above those of the first day as a consequence of a decrease in velocity, and so on indefinitely. This leads to a banded structure which is known as stratification and is characteristic of deposits put down under water. In fact perfect stratification can be produced in no other way, and therefore it can be said that all stratified rocks have been put down by water.

Clays and silts, after having been buried deeply and subjected to great pressure, split into thin leaves or flakes parallel to their bedding and take the name of shales. This tendency to split into foliae or tabulae is known as fissility, and as a general rule the finer the grain or the richer the shale in clay substance the more fissile it is. Hence fissility is considered a desirable quality in a shale clay. Alluvial clays have accumulated in greater or lesser quantity along every stream of considerable size in Iowa and none of the greater formations which enter into the earth's crust of the state are without their shale beds. Not all such beds are available or workable but the majority are worthy of consideration.

It is a well-known fact that the finer particles from hilltops and slopes slowly gravitate toward lower levels. This change of position may be initiated and doubtless accentuated in times of freshets, but even gentle rains facilitate the downward movement until eventually these finer materials find lodgment on the lower hillslopes and ravines, where they are in more or less stable position. They often show some evidence of sorting and stratification, proving that running water has had something to do with their deposition, while in other places no structural features are apparent. They are always of heterogeneous character, both chemically and mineralogically, proving their descent from several different kinds of rocks and also their transported character. Such clays are rarely used for other than soft mud brick.

Ice in the form of glaciers is an indiscriminate carrying and distributing agent. Pebbles and bowlders of all sizes and conditions are carried as easily as the finest particles of silt and clay. The great continental glacier centering over the Hudson Bay region sent out arms in all directions, some of which reached as far south as our state, which was all but covered by the several ice invasions. The great glaciers carried large quantities of rock debris, the finer grades predominating but containing bowlders oftentimes reaching many tons in weight. On the melting of the ice these materials were left strewn over the surface of the area covered and but little rearranged by the action of running water. Such deposits vary in thickness from a few feet to several hundred feet, and are composed almost wholly of unassorted materials known as the dirft or bowlder clay. The several invasions each contributed a more or less characteristic drift-sheet, and as the various lobes were not coterminous the state may be divided into districts according to the surface drifts, as Kansan, Iowan or Wisconsin. These unassorted clays are not looked upon with favor by those engaged in the clay-working industries. Such clays offer serious difficulties to successful working in the grit, pebbles and bowlders contained, many of which are limestone fragments. Furthermore, there is usually present an excess of lime finely comminuted and distributed throughout the entire mass. Portions of these drift-sheets, especially the older ones, which have long been exposed to the action of the weathering agencies, lose most of their lime content save the larger pebbles, which may be removed by some mechanical process. Leached bowlder clays are used to some extent and when due caution is exercised a fairly satisfactory product may be made. The unleached drift clays can only be used with safety by subjecting them to the additional expense of screening and slumming. Beyond the borders and overlapping some of the drift sheets, a fine, evenly sorted material has been deposited. Such deposits appear to be almost structureless and while easily eroded or removed by running water, possesses the propert of maintaining vertical embankments, even assume the magnitude of cliffs as may be seen along the Missouri river. When examined closely it is found that the materials composing such deposits are clay, silt and fine sand, exactly identical with the finer materials found in the assorted bowlder clays which preceded them. Sometimes one and sometimes another of these constituents predominate. As a general rule there is a gradual increase in the sand element from the surface downward, the deposit often terminating in a bed of fine sand. This composite is known as the loess. The distribution of the loess appears to be independent of the local topography. It is usually thickest near the brow of the hills and bluffs, along the principal water courses, especially those which face west. The loess often contains the well preserved remains of arid region gastropods, root casts and lime concretions. Some of the last assume curious and fantastic shapes, the Germans calling them Loess-Puppchen and Loess-Mannschen, because of their fancied resemblance to dolls. The lime balls, when present, usually occur in a zone some feet from the surface and can generally be avoided when the clay is desired for use in the manufacture of clay wares. The loess covers more than half of the surface of the state, as will be pointed out later on, and varies from a few inches to twenty or thirty or even a hundred feet in thickness, affording an almost inexhaustible supply of raw material suitable for the manufacture of brick by the soft and stiff mud, and dry-press process, drain tile and burnt clay ballast. It is the cheapest of all clays to work, requiring neither dynamite nor pick in the pit, and often receiving no preliminary grinding or pugging before being introduced to the brick machine.

Distribution of Clays in Iowa.

In considering the distribution of clays of Iowa, the subject might be taken up from a geographical standpoint alone, or according to the kinds of clays, or the grouping be made dependent upon the nature of the manufactured products. For present purposes it has seemed best to treat the subject from the geological standpoint, in which all may be referred to two groups, belonging to two widely separated geologic eras. Generally speaking, during the first era the great state of Iowa emerged from the sea bottom to land surface, from the northeast toward the southwest, with the exception of a small area in the northwest corner, where occur the oldest rocks in the state. Barring the exception mentioned, there was a progressive upward movement, interrupted doubtless by numerous crustal oscillations until the state was entirely retrieved from the dominion of the sea. The deposits represented which formed the basal series, upon which the later group was superimposed, were laid down by the water and in the water under marine conditions and are stratified. The clays and silts which comprise probably one-fourth of the deposits were consolidated along with the intercallated sandstones and limestones and constitute the shales of various kinds and the fire clays of the lower lying rocks. Widely separated in time and uncomformably overlying the socalled country rock is the unsorted, unconsolidated, heterogeneous debris of the glacial epoch.

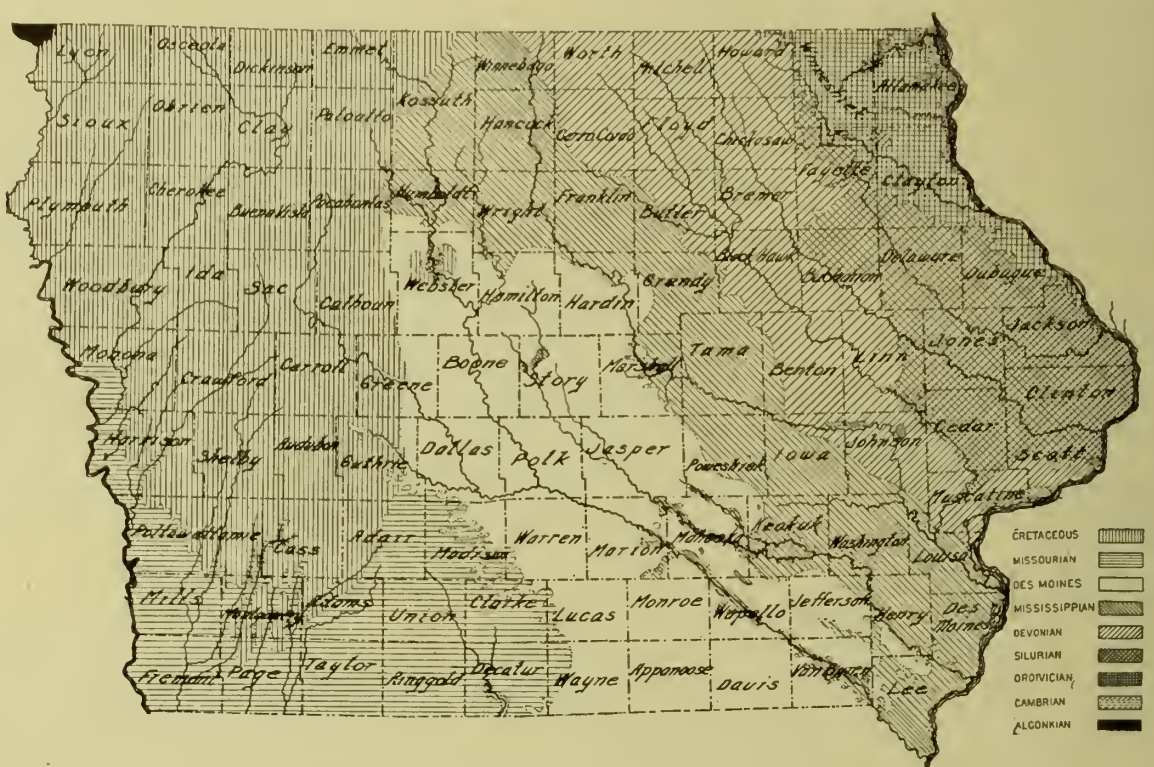
In discussing the distribution of the shales and clays in some detail, they may be considered in the order of their deposition, from the bottom of the section upward, or, what amounts to the same

thing, from the northeast corner, southwestward. Geologists classify stratified rocks according to the fossils contained and their lithological characters, and have given names to the various rock formations, characteristic of given epochs. The oldest rock series in the state containing shale of economic importance is known as the Trenton limestone of the Ordovician. At the base of the Trenton there is a shale bank of some six feet in thickness of excellent quality but is everywhere overlain by a heavy bedded limestone, unless otherwise removed by erosion. Numerous outcrops are known in Allamakee County along the various creeks near Waukon. This deposit has not been utilized. Near the middle of the Trenton series other argillaceous beds appear, but usually in thin bands interleaved with limestone ledges which render them of doubtful economic importance unless they could be used in the manufacture of portland cement. Near the summit of the formation occurs the most important shale member. This bed attains a thickness of twenty feet and outcrops at numerous points in Alamakee, Winneshiek, Fayette, Clayton and Dubuque Counties, but has been developed only at Clermont. There it has been wrought into cream colored brick and tile of excellent quality.

Above the Trenton comes the Maquoketa, which is essentially a shale formation throughout and is generally spoken of by geologists as the Maquoketa shales and is believed to be the equivalent of the shale beds which occur along the Hudson River in New York and the Black River in Wisconsin. The Maquoketa exhibits numerous outcrops forming a zig-zag line across the northeast corner of the state from Winneshiek to Dubuque and Jackson Counties. These shales attain a maximum thickness towards their southern extension reaching, in places, 150 feet. Toward the north they feather out, almost entirely disappearing near the Iowa-Minnesota line. This great formation, comprising one of the most important general purpose clays in the state, is almost wholly undeveloped. Near Colesburg, in Delaware County, it has been utilized in a small way in the manufacture of pottery, chiefly unglazed ware. The Silurian contains no shales worthy of mention.

The Devonian in Iowa was ushered in and closed by a shale making epoch. Certain wells sunk near the eastern border of the Devonian reveal a black, carbonaceous shale, and occasional outcrops are visible along the streams in the same locality. Professor Calvin has given the name Independence to the formation. This shale reaches a considerable thickness in places but is usually interbedded with thin seams of limestone. So far as ascertained no attempts have been made to utilize it commercially with the possible exception of Cresco in Howard County. Its presence has given rise to considerable speculation as to the possibility of finding coal in the localities in which it occurs and has been the cause of some money being spent in useless prospecting.

The upper shale member of the Devonian is much the more important one from an economic standpoint. The principl outcrops



GEOLOGICAL MAP OF IOWA—COMPILED BY SAMUEL CALVIN, STATE GEOLOGIST.

The Lower Carboniferous or Mississippian series, while essentially a great limestone formation, contains several beds of economic importance. The greatest of these is at the base of the series as developed in Iowa and is known as the Kinderhook shales. These are typically exposed in Des Moines and adjoining counties. At Burlington the Kinderhook shales attains a thickness of about 150 feet, less than half lying above the level of the water in the Mississippi river. The beds are overlain by heavy beds of limestone, much more resistant to the weathering agencies than the underlying shales. As a consequence there is a tendency to undermine

the softer materials below and vertical escarpments are common. The area of outcrop for the shales is very limited. The gradual dip of the beds to the westward carries them below the surface so that they do not appear on the surface away from the immediate vicinity of the Great River and its larger tributaries.

Other seams of limited extent occur higher in the series, but few are worthy of special mention. Such seams have been explored and developed to a limited extent in Lee, Des Moines and Louisa Counties. Clays of excellent quality occur near Keokuk and Parrish.

Of all the shale and clay bearing formations the Des Moines stage of the Carboniferous, generally known as the coal, measures excels. Unlike the series just considered, here shales constitute fully one-half of the entire series. Drill records and shafts show that our coal fields contain from one to ten seams of coal varying from a mere film to several feet in thickness, and as a general rule each seam is accompanied by a leached ash-colored clay or clay shale below and overlain by a dark shale above. The former was the old soil and is generally thoroughly leached of its soluble constituents or fluxes, and takes the name of fire clay, because of its ability to withstand high temperatures. Aside from the including shale and clays, oftentimes the more important seams have no apparent relationship to the coal veins. The coal measures cover more than one-fourth of the superficial area of the state, the western portion of which presents but few exposures owing to the thickness of the drift covering. Outcrops are confined chiefly to a zone twenty miles in width on either side of the Des Moines River from Humboldt, Hamilton and Hardin Counties on the north, to Davis, Van Buren and Lee Counties on the south. Des Moines may be considered to be the geographic center of the coal measures district of the state, as well as the center of the clay industries. Outlines of the coal measure which furnish valuable deposits of shale, occur in Scott, Muscatine and Louisa Counties.

At the close of the coal measure period the sea was entirely eliminated for the time being by a general upward movement of the land surface. As a consequence there are no deposits within the confines of the state representing this time. At a later period the sea again encroached upon the land and the northwest fifth of the state was submerged. Series of rocks similar to those put down in the earlier seas were repeated here. Outcrops of shales belonging to this time, the Cretaceous, are confined to the immediate vicinity of the Missouri River and its larger tributaries, with the possible exception of certain shale crops which appear along the Raccoon River in Calhoun and Sac Counties. Sioux City is the center of the industry using Cretaceous clays.

The unassorted clays of the various drift sheets cover almost the entire state save an irregular area in the northest corner of the state, reaching a width of forty miles on the Minnesota boundary and extending as far south as Jackson County; a strip averaging ten to twenty miles in width. The weathered portions of the Kansan, Illinoian and Iowan sheets are used to a limited extent in the manufactture of brick and tile. The finer wash and partially rearranged portions of all the drift sheets, in the form of an alluvial and second bottom or terrace deposits, affords an abundance of raw material for sand brick. These deposits were among the earliest in the state to be utilized but are giving way to the more popular loess clays and the shales of the stratified series.

The Wisconsin or youngest drift sheet offers the most obstacles to its use on account of the great abundance of lime present, both ni the form of pebbles and bowlders and in the comminuted state. Because of its youthfulness the Wisconsin drift the weathering agencies have not had sufficient time to relieve it of its excess of lime. Hence this work must be done artificially by a process known as slumming. Numerous attempts have been made to utilize this drift, but few of them have been attended with success. The Wisconsin covers a tongue shaped area in the north central portion of the state, comprising some thirteen thousand square miles. The Iowa-Minnesota line forms the base of the lobe which extends from the northeast corner of Lyon County on the west to the middle of Worth on the east, and the apex of the lobe is Capitol Hill, in the city of Des Moines. The territory covered by the Wisconsin drift includes all of the upland lakes and ponds, and exposures of the underlying stratified rocks are extremely rare, save along the Des Moines River, and even here, from Humboldt north. The district comprises the typical prairie portion of the state. There are almost no native building materials in the line of building stone and lumber, and at the same time nature has been most parsimonious with her supply of workable clays. More than one-third of the entire area requires thorough tilling before it yields to cultivation. The local demand for clay goods vastly exceeds the local supply, and by far the greater portion of the clay products used are supplied by outside manufacturers.

Overlying the Kansan drift beyond the limits of the Wisconsin, and possibly the major portions of the Iowan and Illinoian, is the loess. As has been mentioned, the loess is the most generally distributed surface deposit in the state, and is most widely used in the clay manufacturing industries. More than two-thirds of the factories of the state use the loess. In the eastern and southern portions the loess rarely exceeds from ten to thirty feet in thickness, but along the Missouri River it often attains much greater thicknesses. The loess outcrops and is utilized at several points within the Wisconsin area, where it has been uncovered by the streams.

Deposits younger than those of the drift sheets and loess may be found along the principal streams previously mentioned as alluvial, and certain deposits found near the bluff faces which are at present being accumulated. These latter deposits have a wide distribution and are confined to no particular drift sheet, but as in the case of the loess, are typically developed on the stream ridges and bluffs which face toward the west. On the Wisconsin drift in Story and adjoining counties, the bluffs which face east along the principal streams are generally covered with a structureless deposit of sandy silt and clay, free from pebbles and bowlders and thoroughly leached. Such deposits are supposed to be accumulated through the agency of the wind and have been used at numerous points in the manufacture of sand brick.

Summarized briefly, Iowa possesses no deposits of pure kaolin or kaolinite such as are used in the manufacture of high grade chinas, porcelains and fancy wares. The clays and shales are all mechanical mixtures composed of clay base, silt and fine sand, varying widely both chemically and physically. Clays which have accumulated in place are unimportant and confined to the "geest" of the northeast corner of the state. The great bulk of Iowa clays have been transported. Of these, the sorted and stratified materials of the older rocks, whose outcrops occur along the great rivers of the state, furnish an abundance of crude material adapted to the manufacture of all grades of brick by all the processes, hollow block, drain and floor tile, sewer pipe, terra cotta, and the various grades of pottery. The unassorted, to the partially assorted, materials of the drift and associated deposits, which cover almost the entire area of the state, afford raw material which can be wrought into common brick, drain tile and burnt clay ballast. None of these deposits have been fully explored and their development is in its infancy.

This paper prompted a number of questions which Professor Beyer answered at length.

Next on the program was a paper on "Drying Clay Ware by the Use of a Suction Fan," by O. T. Dennison, of Mason City, Ia.; Mr. Dennison's paper carefully described this system and gave the

result of his experience with the fan apparatus. The whole of this paper will be given in a succeeding issue of "Brick".

Next followed a paper on "Brickmaking from the Office Window," by M. Joeston, of Sioux City. Mr. Joeston took occasion to show how necessary to a successful business is a good office man, and demonstrated that the office man does not in reality have the soft berth that is supposed to be his. This paper will appear in a succeeding issue.

Thursday, 9:30 A. M.

ON CERTAIN PHASES OF CLAY TESTING.

By Prof. I. A. Williams, Ames.

As reported to you at our convention last winter, the Department of Mining Engineering in the College at Ames is engaged in making a series of physical tests of Iowa clays. At that time these investigations were scarcely begun, but during the present year, through the co-operation of the clayworkers of the state in furnishing samples of their clay materials, we now have the work fairly under way.

It was the original intention to carry out, separately, series of tests dealing with the different physical properties of clays. That is, to apply those tests to Iowa clays which have been found useful in deriving an insight into the properties of clays elsewhere. Elaborate investigation of the character of Iowa' clays have never yet been made. It therefore becomes a matter of importance to obtain information along all these lines, and the methods employed must be largely similar to those which have been in use among earlier investigators for determining those characteristics of clay which make it of use to man. It is true that no two clays will show exactly the same in all their physical properties when subjected to the same tests, although they may be alike in appearance and essentially the same in chemical composition. But in order to ascertain their similarities and differences it is essential that the tests applied be uniform. so that any results derived will be intelligible and comparable. It is also true that some of the methods of testing clays, which were in vogue a few years ago, are now partially or entirely discarded as failing longer to signify what they were at first designed to express. With more extended researches, in this, as in other lines of inquiry, they become insufficient. An instance of this is found in the use of the tensil strength of dry clay as a measure of plasticity. This has been used to considerable extent and, while there are now strong grounds for believing that the tensile strength of dry clay is not always a measure of this important property, still this method is quite widely used, and perhaps for the one reason more than any other, that no better means has yet presented itself. Moreover, in order to be on a par with those of our neighboring states possessing similar classes of clays, that have carried on more or less extended experiments in gaining a knowledge of their clays, we must employ parallel methods of research.

In taking up this new line of work, therefore, it was thought desirable to subject our clays to all methods of treatment for determining their several properties that have been to any considerable extent employed in the past, whether these tests could be recommended most efficient at the present time or not. In this it is evident that all the information obtained might not be of the highest possible and immediate value in a practical way, but it forms a necessary basis for further investigation, and all adds to the sum of our knowledge of the properties of clays, the ultimate end of which is utility—to aid in bringing about the fullest development and utilization of our abundant clay resources.

The final aim and object of all investigation, then, be they physical or chemical, is to gain such a knowledge that clays may be surrounded with conditions, which if they meet these conditions, will be suitable for the manufacture of a certain class of ware. At present, much can be told by observing the properties of raw clays, as to whether they will be available for making brick or tile, or other ware, but science here has far from reached that stage where it is possible to say with certainty this clay is suitable for manufacturing one class of ware and that clay has properties which adapt it to another line of manufacture. These things can now only be conclusively ascertained by putting the clay through the actual processes of manufacture. It must be molded, dried and burnt. When subjected to actual trial, a clay does not always act exactly as would be expected from its chemical and physical properties as we are now able to express them, though by present means, it is usually possible to predict fairly accurately some of the principal changes which a clay will suffer. For instance, it is commonly possible to tell about what color clay will burn from its chemical anyalsis and also something concerning its fusing point from its chemical and mechanical analysis. We are reaching towards the goal which it is the purpose of all these lines of investigation to ultimately attain, but before this the avowed object of all efforts along these lines is within grasp, there are a few difficult steps to be taken and obstacles to be surmounted. And yet, all the properties which clays possess, all the peculiarities which they exhibit, when subjected to the several conditions of manufacture are, and must be, due to peculiarities in their chemical and mechanical make up. It is quite often easy to undersand just why one clay shrinks more than another in drying, because of difference in size and shape of grain composing them. But even this will not always hold true. Occasionally clays that consist of the same elements in the same proportions behave very differently in use under the same conditions. This is found to be owing largely to the way in which these elements are combined in the clay, that is, the mineral constitution of the clay. It thus becomes a chemical problem to analyze the material mineralogically and then find out just what the mineral makeup has to do with the behavior of the clay. It remains, therefore, to perfect the present methods of analysis and of clay testing, or devise new ones, so it can be told by the knowledge derived from these means, what a clay will endure, what changes it will suffer under heat, and therefore, for what use best adapted.

It is thus seen that investigation of raw clay materials may be carried on along two principal lines, physical and chemical. Chemically, clays are found to be composed of certain elements. These elements are restricted to a certain few, but the proportions in which they occur in clays vary greatly. For ordinary brick clays, chemical knowledge has its greatest utility in furnishing a means of interpreting the different phenomena which these clays undergo in manufacture. Burning brings about a change in the physical condition of a clay through chemical processes. These changes may be entirely conducive to the structure desired in the finished product. Oftentimes, however, through some slight irregularity in some part of the operations of manufacturer or, even in the absence of any known irregularity, there occur changes which are detrimental and hard to account for and, therefore, much more difficult to remedy. A kiln of ware may soften and lose shape when burnt at the usual heat for the clay employed. Clays are not constant in composition, although they come from the same bank and even the same stratum. Such a state of affairs might be brought about by a variation in composition and would be emphatic recommendation for an occasional analysis of any clay in use. Again, a kiln of ware may be carried somewhat, perhaps only a few degrees, beyond its usual finishing temperature, or is held at, or hurried through a given stage of the burn other than is commonly done. As a result, the ware is cracked or disfigured or partially fused or melted down. These accidents, if we may call them such, frequently happen, sometimes through neglect and at other times

unavoidably. Though the variation in some part of the process may be ever so small, the fact that more is spoiled establishes a danger line which must not be passed. A knowledge of the composition of the clay in use is here quite important as indicating to a considerable degree the limitations of a clay under fire. In other words, it shows in what direction danger is imminent and puts the operator on his guard to approach that line with trepidation.

Clays are always impure. That is, besides the alumina silicate base there are always present larger or smaller quantities of the fluxing elements—those substances that make the clay fusible. Common among these are lime, magnesia, iron and soda. In general, it may be said that the larger the percentage of impurities present, the lower the temperature required to melt the clay. Sometimes large amounts of one or more of the fluxes are present at the expense of some others, while occasionally there are several in nearly equal proportions, or some of the common ones may be absent entirely. Although one may replace another to some extent in affecting fusibility, still each possesses its own characteristic influence and mode of action. Some, as the alkalis, are slow in their action and when the temperature is reached at which they become chemically active, a gradual softening or vitrification is brought about eventually leading on to easy fusion with rising temperature. On the other hand, lime, for instance, which in the absence of the alkaline fluxes does not begin action until a fairly elevated temperature is attained, in the neighborhood of 2,200° F., is very violent when its work is once begun. It gives little warning in the way of a gradual softening of the ware, but the clay is changed, within a rise of a comparatively few degrees, from a firm body to a slagged and shapeless mass. The province of chemical investigation embraces the determination of the percentages of impurities in clays as also of the essential ingredients. From this standpoint, chemical control is just as important in the clay industries as in any other industry using the raw products of nature. It furnishes a means of first, avoiding difficulties, and second, of explaining one if it occurs.

A most important application of chemical analysis is made in the compounding of body mixtures in the manufacture of many of the finer grades of clay wares. Pottery and tile bodies are nearly always mixtures of clays and other substances and a strict knowledge of the exact composition of their ingredients is imperative. In the making of glazes and enamels, compounding of the raw mixtures is coming to be done more and more by making use of the chemical formulas. These applications are of course somewhat out of line for the large number of us, so I have merely stated these facts to show to what extent chemistry plays a part in the clayworking industries.

It is the primary object of this paper to present to you an outline of some of the work in clay testing that is being carried on at the Iowa State College. As previously stated, we have set out to investigate Iowa clays from all standpoints, to determine all possible concerning their several properties by methods at present in use.

Among the physical properties of clays which it is of interest and importance to determine are: Slaking, or the crumbling of dry clay when wet with water; fineness of grain and porosity; plasticity, that power that clays possess of taking any shape when wet which form is retained when dry; shrinkage on drying and in burning; fusibility, the power of clays to withstand heat.

Clays as they come from the bank are often fairly dry if they have been projected from percolating waters or have dried out by exposure. They are seldom impregnated with sufficient water that they do not need some addition before reaching the molding machinery. The object in adding water is to bring the clay to a plastic condition. This it does by breaking down the more or less solid structure and reducing it to a pulpy mass. This crumbling, or slaking as it is called, can best be noticed by treating a few small pieces of air dried clay. When they are immersed in water, if the clay is not too thoroughly indurated, small fragments will begin to scale off and settle to the bottom of the containing vessel. These small pieces, which are usually of a flaky nature, continue to form and themselves to become gradually reduced in size until, if the clay be a coarse grained one, the original structure of the clay is entirely destroyed and it is reduced to a pulverulent mass. The readiness with which clays respond to water treatment varies very much from those that slack down in a few seconds to the harder shales which show practically no effect after a week's soaking unless they are first broken up by grinding. Experiments of this sort with shales from the different formations in Iowa showed a range of variation of from five minutes to several weeks for the complete slacking of small samples with a maximum diameter of one inch.

The importance of this property is at once apparent. A clay which takes water eagerly and crumbles down will work up into the plastic moldable condition much more readily than one which is more resistant to this slaking action. It is very important also in connection with the weathering of clays. Where clays or shales are exposed to the weather, either artificially or naturally, they gradually break down or weather. Water is very important in this process, as it exerts not only a slaking or crumbling action but a chemical or solvent action as well.

The facility with which a clay absorbs water and the amount required to render it plastic depend to a considerable extent on the fineness or size of the individual grains of which the clay is composed. It is evident that if a clay is made up of multitudes of small mineral particles, it is impossible for them to be in contact with each other at all points even when the clay is in the most compacted condition, unless they are of similar shape and size. That they are not is evidenced by the fact that dry clay absorbs water which shows that it is porous. The microscope also reveals the shape and size of grains to be variable. Some are flat and rounded, others are elongated or sharp and angular in outline. The size of these grains ranges from sand which is visible to the unaided eye to such minute particles that the highest power of the microscope fails to delineate them. It is clear that such a mass of grains varying as they do could not settle together in such a way as to fill all the space which the total volume of the clay occupies. That is, when the particles are in contact at all possible points there are still left between them small spaces, and these spaces connect with others, thus forming a pore system throughout the clay mass. Whether these openings are small or large depends on the shape and size of the clay particles, whether they are all of nearly of one size or have a range of sizes. Thus the very smallest might fill in the spaces between the larger ones. It is difficult to say whether one clay is more porous than another if nothing is known as to the size and shape of the grains. One may absorb water greedily because of its coarse grain and large pore spaces and we would call this a porous clay. Another, while it may not take up water with such avidity at first, may ultimately require just as much to saturate it as the former coarse grained one. The actual amount of pore space in the two would be the same and their differences with reference to water absorption would probably be due largely to form and size of the individual mineral particles of the clay.

The composition of clays with reference to the size of grain is determined by analyzing them mechanically. The common method of accomplishing this is by thoroughly agitating the clay in water and by allowing it to settle for different lengths of time, at the end of which all that still remains in suspension is tapped off. In this way it is separated into a series of sizes and the diameter of the individual particles is measured by the microscope. No such analysis of the shale clays has as yet been made, but analysis of the Missouri River loess clays, which respond to this method of analysis more readily, shows the extremely finely divided condition in which some of the particles exist. The range in size, barring out concre-

tions and all matter remaining on a 150 mesh sieve, which was never over 3 per cent, runs from a maximum of .004 in. to below .0001 of an in. in diameter.

Plasticity, or the power of clay when wet to take a shape and retain it, is perhaps the most important characteristic which clays possess. Just what the real cause of plasticity is, is not known. Some have attributed this property to the size of grain, holding that the finer the grain of the clay the greater the plasticity. Some have assigned as its cause the plate or scale like form of the particles and that the strength of the clay is due to the interlocking and cohesion of the grains. Others have said the more water required to bring the clay to a workable condition, the greater the plasticity. Still others make use of the tensile strength of dry clays as an index of this property, regardless of the amount of moisture required.

This latter method has been used to some extent in determining the plasticity of Iowa clays. They were made up to a plastic condition with water and molded into brickettes, figure 8 in shape, in cement brickette molds. After thorough drying, the smallest cross section was accurately measured and they were broken in a cement testing machine. Their strength in pounds per square inch was calculated. For the shale clays, they were found to stand a pull of from 40 to 210 lb. per sq. in. Among clays of this class those standing highest were in general the most plastic. In comparison with clays of other classes, however, as the loess clays, which when mixed with water were short and showed very poor plasticity, this relation was not found to exist. Some of these stood a tension as high as 310 lb. per sq. in. Such a tensile strength compares excellently with natural cement and many 7-day neat tests of portland cement give values only a little higher. A duplicate set of the brickettes broken dry are to be burnt and broken in the same way, the object being to determine the relation of the strength of the dry clay to that of the burnt product. In other words, to ascertain if the strongest clay when dry tests the highest when burnt.

It is well known that clays on drying undergo a decrease in all their dimensions. This decrease is due to the settling together of the clay particles when the water is evaporated. The fact that the larger the amount of water necessary to render a clay plastic, the greater the shrinkage is found to be, suggests that the loss of the water is the prime cause in bringing about the diminution in volume. In speaking of the porosity of clays, we have seen that the volume of pore space may be measured by the amount of water that will be absorbed without changing the solid form of the body of clay. That is, the water required to fill the interstices among the grains when they are touching each other at all possible points. This is called pore water and does not alter the volume of the clay. If more water than is necessary to fill the pore system is added, it begins to get in between the points of contact of the clay granules and therefore to force them apart. Soon each little particle is surrounded with a thin film of water, separating it slightly from each of its neighbors. When clay is dry, the cohesion or attraction of each clay particle for every other, holds the mass intact. When the clay is wet and each particle is separated from every other by a film of moisture, this same force of attraction still exerts itself to hold the mass together, but because of the intervening space and the confining film of water through which it must act, it is weakened and the particles are not held as firmly together as in the dry clay. Thus surrounded and lubricated, so to speak, with a capsule of water, each grain glides upon its neighbors when subjected to any outside pressure and the clay may be deformed and molded into any shape without rupture. If now, more water is added than is required for plasticity, the film round each grain becomes thicker, the distance across which cohesive attraction must act is greater, so great, perhaps, that the particles no longer cling to each other and the clay gradually melts down and loses its shape entirely. During successive additions of water, the clay will increase in volume so long as it retains its shape. If the water is now allowed to evaporate from the clay, the conditions that were noted in wetting up will be repeated in reverse order. The clay will begin to shrink as soon as water commences to leave it and will continue to do so until the film of water is removed from between all points of contact of the grains and they again settle as closely together as possible. At this stage shrinkage ceases, but there is still left in the clay all the water the pores can hold, which amounts to from 1 to 5 per cent, depending of course on the porosity. Generally speaking, the finer grained clays shrink more because of the large number of minute grains to be surrounded with water. But they are usually the more plastic and strong and hence better able to withstand an excessive shrinkage without cracking. The most prevalent cause of cracked ware is the too rapid evaporation of the water from the surface of the ware. The moisture from the interior being unable to reach the outside as rapidly as it would be evaporated.

The linear shrinkage of those of our shale clays that have been tested runs from 3 to 11½ per cent. Among the loess clays, it is somewhat less, from 2 to nearly 6 per cent. These results were derived from the brickettes used for tensile strength tests.

Fire shrinkage is another important factor in the utilization of clay. By this is meant the change in volume which a clay suffers during burning. This contraction begins to take place at red heat in all clays and continues to vitrification where the clay reaches its greatest density. The temperature of the vitrifying point of course varies with different clays. The shrinkage which begins at red heat is largely due to the loss of water which was chemically combined in the clay. This water varies in per cents from 3 to 4 to nearly 14 in high grade clays. Any carbonaceous or organic substances in the clay commence to burn out at red heat and are a factor in the shrinkage of the clays which begins at this stage. The expulsion of these ingredients leaves the clay in a porous condition, but its contraction is not great until a sufficiently high temperature is attained that the clay commences to soften and to fill in these open spaces. If the heat is carried far enough the pores are eliminated and the clay shrinks to its limit. Fire shrinkage has not been determined on any of our clays, but in Missouri shale clays it is found to vary from 1 to 7 or 8 per cent. Loess clays vary from 2 to 10 per cent.

The practical bearing of the determination of both air and fire shrinkage comes in the application of any given clay to the manufacture of ware of given size. It is necessary to know how much a clay when molded with a certain percentage of water will change in volume through drying and burning. With this knowledge, dies and moulds may be constructed which will form ware of such a size that when it comes from the kiln, it will have the exact dimensions desired in the finished ware. In this regard, it would of course be necessary to experiment with the clay, ground to the fineness, mixed with the per cent of water and burned to the temperature required in the actual manufacture of the ware.

When we speak of the fusibility of a clay we have in mind the temperature required to fuse, or melt it. Clay, being a mixture of minerals does not act in changing from the solid to the liquid form as do many elementary substances or simple mineral compounds. Lead, for example, on being heated to a certain temperature begins to melt and, little matter what the mass may be, in the space of a few seconds perhaps and with very little if any rise in temperature becomes a thoroughly liquid substance. Similarly with ice. On being warmed to 32° F., it changes to a liquid, water, and its temperature will not rise one degree until it is all converted to the liquid condition. It is not so with a clay. Clays are composed of minerals each having different and fairly distinct melting points of their own. When a clay is subjected to a rising temperature the melting points of its several components are successively reached and at each of these points the minerals tend to fuse. Any substance fusing in contact with another which is more refractory will tend to attack the latter forming a compound with it which is more fusible than the second substance alone. That is to say, the fusion point of each

has been changed, the former raised, the latter lowered, by both merging into a compound whose melting point is intermediate between the two. As the temperature rises, the fusion point of this composite substance is reached and as it melts, attacks still more resistant elements in the clay lowering their melting points and so on till ultimately the most refractory alumina and silica are brought into fusion at temperatures very much below their normal melting points. From this it may be drawn that the larger the proportions of these substances in a clay, that melt easy, the lower the temperature at which the whole clay body will be brought into a state of fusion. Also the freer a clay is from the fluxing ingredients, the higher will its melting point be. It would seem therefore that in order to determine the fusibility, a chemical analysis only would be necessary from which might be expressed the relation between those elements that melt readily and those that are difficultly fusible. This has been attempted but so differently do these elements act in the presence of each other and in such various chemical combinations do they occur that no effort along this line can be said to have been entirely successful. Besides expressing a relation between the fluxing compounds and the infusible base of the clay as an index of fusibility, the fineness of grain and compactness or density are known to exert an influence. The finer grained a clay, the more closely the little particles will be packed together when the clay is dry and therefore the more points at which they will touch each other. The more intimate the contact between bodies, the more readily will heat be transmitted from one to another and consequently if one particle melts, its influence upon those which it touches will be the greater. Any formula, therefore, which assumes to express fusibility from the composition of a clay, must take into account as well, the physical condition, as oftentimes quite as important as the other. The only means of determining without question the fusing point of clays is by actual temperature experiments.

The temperature at which clays fuse varies considerably. Impure clays melt at from 1000° to 2000° F. More resistant ones, those that are freer from impurities, stand as high as 2800 to 2900° F., and the purest varieties do not melt at temperatures that are accurately measurable by any instrument yet devised. Temperature tests have been made with some of the Iowa shalos used in the paving brick industry. They were found to soften at from 2200° to 2500° F., and to lose shape at 90 to 275° higher.

There are not many clay wares that require burning to vitrification. Usually when a clay is burnt to such a condition and treated in the ordinary way, while it is compact and non-porous, it is often brittle besides being a better conductor and will not serve the purpose of a less hard burnt product. Paving bricks and sewer pipe are vitrified, but they are given a tenacity or toughness by very slow cooling, a process analogous to the annealing of glass, which fits them for their special purpose. In the making of any vitrified wares they must be annealed to give them the requisite strength. With clays used for the manufacture of this class of wares it is very essential to know the temperature required to fuse them, and especially the range between incipient vitrification and fusion. Where different strata in the same bank are made use of, it is essential to know the heat resisting qualities of the clay from each in order that the proper proportions may be taken to give the product the required characteristics. With clays that are not used for making vitrified ware, it is also useful to ascertain the fusion points and the changes that occur in the clay at higher heats, that control may be had of the burning process and in this way, knowing the limitations of the clay, turn out the best possible product from the raw materials made use of.

Some discussion followed this paper, Mr. Joannis asking whether it would be possible to lengthen the danger line mentioned in the paper as for instance, if the manufacturer of ordinary building brick wished to take up the manufacture of paving brick would it be possible by the judicious addition of the necessary elements to lengthen the danger line so as to obtain a perfect vitrification? Professor Williams in reply stated that it would be possible with these various elements, their respective molecular weights indicating their relative values, which might be so adjusted as to obtain the end desired.

W. E. Wild, of Cedar Falls, Ia., asked if it would be possible to carry the burning far enough to eliminate the lime, and another question was asked as to how far every fine grinding of the clay containing such lime would assist its elimination. Professor Williams replied that it would be possible to a certain degree but that lime itself must be regarded as infusible.

The subject of discussion then trended towards the general adoption of brick for the making of culverts and bridges. W. W. Lewis, of Williamsburg, Ia., commented on the fact that many culverts were made of rock and the large mortar joints used in this construction tended to weaken it. He considered brick by far superior to stone. Experiments in his township had shown that the brick culvert was less expensive than the stone and far more enduring.

Subsequent remarks from various members show that even if the brick should cost a trifle more, such extra expense should not be allowed to cut any figure, that brick was far superior for such a purpose to stone or piles for bridges.

It was advised that there should be a committee appointed to lay the matter before the boards of supervisors so that brick should be more extensively employed in the construction of culverts and bridges.

Mr. McHose objected on the ground that such an advocacy at such a place would be of little value; he recommended that each man constitute himself a committee to lay the matter before the supervisor of his own county; that neither he nor anybody else was interested in the work that was being done by the supervisors of another county. It was urgent that the best should be obtained in our immediate district.

G. J. Smith, of North English, Ia., who had been nominated as one of the members of the committee, rose to protest on the ground that he thoroughly opposed the motion as he did not believe that there was one in twenty of the brickmakers assembled that was capable of supplying the material necessary for such construction if he was asked for it. He thought that the best plan of action would be for the brickmakers to make a number of pieces suitable for culverts and bridge construction and have them on their yards and then to call the attention of the county supervisor to the material and point out its suitability for the purpose. He had no doubt whatever that this kind of missionary work would be more effective than that of appearing before the board of supervisors in a committee.

W. W. Lewis, of Williamsburg, insisted that Mr. Smith should remain on the committee notwithstanding his protest, and that for the very reason that he thoroughly understood the shape of the material required and its general adaptability for this construction he would be best able to present before the board of supervisors a clear exposition of the advantage of clay products in sewer, culvert and bridge construction and that he was confident, notwithstanding the fact that Mr. Smith was opposed to this method of presentment, that he would say nothing before the board that would hinder the progress of the movement. Mr. Smith replied that he consented to retain the position, remarking that anyhow he would never throw a club in a clay man's wheels. The committee was appointed.

Next, "The Future of the Tile Business," was discussed in a paper by Mr. H. F. Zartman, of Sioux City, who reviewed the present situation of the tile business and outlined the means for securing a continuation of prosperity. We shall publish this paper later.

HOW TO MAINTAIN EFFICIENT LABORERS.

This discussion was opened by C. J. Holman, who stated that the first law which God gave to man was always to be kept in sight, that man was obliged to earn his bread by the sweat of his brow. He had found no difficulty in finding men willing to work, and he was able to keep these laborers contented by general encouragement and by the systematic raising of wages according to their respective ability. He had men at present with him who had been in his service from 15 to 25 years. He believed in paying men by piecework wherever possible, and some of his men engaged in setting and laying brick earned from $2 to $4 per day.

Mr. Platt, of Van Meter, Ia., said that this scheme might work very well where one was not opposed to organized labor; he had found in his case that to increase a man's wages was often to spoil him.

Mr. McHose, of Boone, Ia., said that it was impossible to apply any rule which would fit every need. His idea of the successful method of maintaining laborers was for the employer to have sufficient tact to administer favors and rebuke according to the man's ability or inefficiency. All men were not the same at all times in all places, and what would work with one set of men one year would not work with another set of men the succeeding year. Tact in his opinion was of the greatest value.

HOW TO CURTAIL FUEL EXPENSES.

The opening of this discussion excited many smiles among the clayworkers present. Mr. Snyder, when asked his opinion of the matter, said that he could conceive of no means of curtailing fuel expenses but that of shutting down altogether. Mr. Platt said that he thought one of the primary factors in the curtailment of fuel was that of using the best fuel obtainable. He had been experimenting with fuel for some years and he found that by the use of shaking grates he was able to use a cheaper fuel with more advantage. Another method in which fuel expenses might be reduced was that of filtering the boiler water so as to lessen the lime deposits. Such lime deposits insulated the boiler and rendered the heating of the water much more difficult. Another place where curtailment of fuel expenses might occur was in the burning of brick. The main thing in burning brick was to get the heat direct through the wares at a uniform rate. It was often the case that too much draft was used; only enough should be maintained to insure a good combustion. The shape and form of the kiln had much to do with the fuel expenses. He was not an advocate of the square kiln. He considered the round, down-draft kiln the most perfect unless the continuous kiln was employed. The question of the mixture of coal dust with the clay for the purpose of saving coal was raised and Mr. Swift, of Washington, Ia., stated that he had done so for some time with satisfactory results, the proportion being two shovelfuls to the cart load, the cart load being capable of making about 400 brick. It was sprinkled, and crushed with the clay, the coal dust being obtained by the screening of the coal slack used for the boilers.

Charles B. Ebert, of Pittsburg, Pa., rose to point out the advantage of coal steaming over gas. He had used gas in his boilers and to burn his kilns. It cost about $7.50 per day to run the boilers and when a cool wind prevailed it reduced his steam. The substitution of coal for gas resulted in the saving of $5 a day. Although it was stated that it was possible to run the gas engine for 50 cents per day, he could conceive of nothing better for a brick plant than a steam engine. Gas was generally unreliable and when anything happened to it the whole works were stopped, but using coal if more steam was necessary it could be obtained by the expenditure of more fuel. C. A. McHose stated that in the mixture of coal with clay it was well to watch that too much coal dust was not put in as it would make the ware swell.

H. F. Zartman, Sioux Rapids, Ia., placed before the convention the difficulty that he had had with his brick which air-checked in burning. They seemed to dry well without any checking whatever and that the brick when burned were good ringing products, but this small checking hurt their sale.

Mr. Heidenrich, of Hedrick, Ia., said that he thought that if Mr. Zartman would watch closely he would find that this checking had occurred in drying, though perhaps in a very small degree, and the burning tended only to accentuate the checking.

G. A. Wild asked of the convention whether anybody was able to give a synopsis of the lien laws of the state.

THE LIEN LAWS OF IOWA.

The general provisions of the lien laws of Iowa are abstracted as follows, from which it would appear that a brick man selling to a contractor is a sub-contractor and has only 30 days in which to file a claim. The 90-day limit is for sales direct to owner.

Code of 1897, Sec. 3088. No one shall be entitled to a mechanic's lien who, at the time of contracting to furnish material or labor or during the work, shall take any collateral security on such contract. But after the work is completed such collateral security shall not affect the right to a lien except the latter be expressly waived.

Sec. 3089. Every person who may do any labor upon, or furnish any materials, machinery or fixtures for, any building, erection or other improvement on land, including those engaged in the construction or repair of any work of internal improvement, and those engaged in the grading of any land or lot by virtue of any contract with the owner, his agent, trustee, contractor or sub-contractor, upon complying with the provisions of this chapter shall have for his labor, materials or machinery a lien upon such improvement and upon the land belonging to such owner on which the same is situated, or upon the land or lot so graded, to secure payment for such labor or materials. For a lien to attach there must have been a contract with the owner. The lien attaches only to the interest of the owner. Contracting for and procuring the erection of a building or using it after erection for a residence is prima facie evidence of ownership. A lien once attached remains on the land after the materials may have been removed or destroyed. The lien attaches to the building and not to the materials furnished, and purchaser of such materials takes free from any lien. Persons furnishing material have a lien for all the material furnished, whether used or not. The statute does not apply to public buildings, bridges, etc., which are exempt from execution.

Sec. 3102. In case of public buildings and improvements the person furnishing labor or materials has a claim against the public corporation, not exceeding the contract price. This claim shall be made by filing with the officer through whom payment is made an itemized, sworn statement of the demand within thirty days after the last work or material has been furnished. Such claims have priority in the order in which they are filed.

Sec. 3093. To preserve his lien against the owner and to prevent payments to the principal contractor or to intermediate sub-contractors, but for no other purpose, the sub-contractor must, after commencing such labor or furnishing such materials and within thirty days after completion thereof, serve on the owner or his agent or trustee a written notice of such claim. Service may be made by any one, and if the owner, his agent or trustee is out of the county wherein the property is situated, the return of that fact shall constitute sufficient service from and after the time it was filed with the clerk. The lien of a sub-contractor may be discharged by the owner or intermediate contractor by filing with the clerk of said court a bond in twice the amount of the claim, with two or more sureties approved by the clerk, and conditioned for the payment of any sum for which the claimant may obtain judgment.

Where a contractor has received payment in full before agree-

ment is made with a sub-contractor, the latter can have no lien against the owner.

Until the expiration of thirty days the owner has no right as against the sub-contractors to make payments to the contractor, except as specified in his contract.

Sec. 3097. All persons furnishing materials or doing work provided for in this chapter shall be considered sub-contractors, except such as have contracts therefor directly with the owner or his agent or trustee.

Sec. 3099. Upon written demand of the owner or his agent or contractor, served on the person claiming the lien, to commence action to enforce such lien, such action shall be commenced within thirty days thereafter, or the lien shall be forfeited.

Mechanic's liens are assignable and follow the assignment of the debt for which they are claimed.

Several men rose to testify to the inefficiency of the present lien laws, especially as regards the laying of brick sidewalks or of tile in a field or of the furnishing of brick for a public building. In this case there is no lien law to protect the brick manufacturer. The lien law is so hedged around by difficulties that the remedy is worse than the disease.

Afternoon Session, 2:35 P. M.

Prof. A. Marston, of Ames, Ia., was to have given a paper on "The Preliminary Investigation of the Properties of Gypsum Relative to Its Use as a Mortar in Brick Work." He stated, however, that the investigations were not complete and that he had substituted for this paper one that would probably be of equal interest.

TESTS OF STRENGTH OF HOLLOW BUILDING BLOCKS.

By A. Marston.

At the present time interest is being attracted to the use of hollow blocks in place of solid brick in building construction. The advantages of these blocks are well-known and some of them may be enumerated as follows: The principal advantage probably is in the saving of weight. In shipping this is of great importance, especially where the material must be sent long distances. In the walls themselves the saving of weight may often be of great importance as it lessens the loads on the other parts of the building and on the foundations. Another advantage is in the air spaces in the walls made by the hollow spaces which insure a drier wall. As regards the convenience in rapidity of laying the writer's impression is that the hollow blocks have the advantage in this, but he would request the opinions of the members of the association who have had experience along this line.

However hollow blocks are comparatively new in the construction of brick masonry and it often becomes difficult to secure their use. The principal objection which is raised to them is their lack of strength compared with solid brick. This objection is so strongly urged that it furnishes a valid excuse for the presentation of the few tests which are to be described blow. In the summer of 1901 the Grinnell Opera House Co., of Grinnell., Ia., was considering the use of hollow bricks in the construction of their new opera house. Fearing that they were too weak for the purpose the company decided to have some tests made before deciding on their use. The specimens to be tested represented the product of the Mason City Brick & Tile Company of Mason City, Ia., and were not selected by the company for the test. Instead they were taken at random from a pile of hollow blocks already delivered in Grinnell for the construction of another building. Hence they may be supposed to represent the average material that is actually used in building.

Four blocks were tested. Tests were made on the 100,000-lb. Riehle testing machine at the Iowa State College at Ames. The sizes of the blocks were respectively 4x8x12, 4x4x12 and 4x5x12. Two blocks 4x8x12 were tested. The 4x5x12 is an unusual size. These are the nominal dimensions in each case. Actual dimensions sometimes varied a quarter of an inch or a little more from those given. The results are indicated in the following table.

SIZE AND POSITION OF BLOCK.	TOTAL LOAD, LB.		TONS PER SQ. FT.	
	First crack.	Crushed.	First crack.	Crushed.
12x8x4-Flatwise	13,500	79,500	10.9	64.0
12x8x4-Edgewise	9,000	39,750	13.5	59.6
12x5x5-Flatwise	10,000	34,000	11.5	39.1
12x4x4-Flatwise	12,000	38,600	17.6	56.5

In all these tests the specimens were imbedded in plaster of Paris at the top and bottom which was allowed to set 90 minutes. An adjustable top bearing was used to enable the machine to adjust itself to lack of parallelism of the top and bottom.

For comparison it may be said that architects allow 5 to 10 tons per square foot pressure on brick masonry. This would give a large factor of safety even in the case of walls built of hollow blocks. Of course in the wall built of hollow blocks piers of solid brick are usually built to carry concentrated loads from beams and trusses. It would take a solid wall of common brick about 80 feet high to give a pressure of five tons per sq. ft. from its own weight alone, and of course the wall of hollow blocks would have to be much higher than this before giving a weight of five tons per sq. ft., which our tests show would be only about one-tenth of the strength of the hollow blocks.

The writer has made a few other tests of hollow blocks which gave still stronger results than in these cases. It would therefore appear in general that hollow blocks should furnish a wall amply strong for the circumstances under which they are commonly used.

One of the most interesting discussions of the convention followed this paper. C. J. Holman asked if hollow block had been found to be superior to hollow brick, to which the professor replied that he had no preference.

G. J. Smith, of New English, who has had many years of experience both as a brickmaker and a brick layer, advocated the hollow block. He showed to the convention the several advantages which he considered were possessed by the hollow block, especially as regards its strength when placed in the wall, and recommended blocks of 4 x 5 and 5 x 5 in. He contended that a wall of hollow block was much stronger than a solid brick wall.

C. J. Holman, Sargents Bluffs, took the opposite position, contending that his hollow brick was superior to Mr. Smith's hollow block, and the controversy, which was conducted in the greatest of good humor, ended by an agreement for each to send samples of their hollow brick and block to Professor Marston at Ames, who would be able to test them for their respective strengths in pressure and give his report to the convention next year.

Then followed the report of the secretary and treasurer, Robert Goodwin, jr., the result being very gratifying in that a balance of $132.50 remained in the treasury after all liabilities were paid. The election of officers took place next, W. W. Lewis, of Williamsburg, being elected president, and S. C. Beasley, Council Bluffs, vice-president; Mr. Goodwin was re-elected secretary and treasurer.

Then followed the report of the committee on resolutions.

Whereas, A large portion of the farm lands of our state need drainage and the increased value of lands make drainage very desirable, it is contended that the present drainage laws are inadequate to the promotion of efficient drainage in all cases, and it is resolved

that it is the sense of this convention that the present general assembly would modify and improve the drainage laws of the state so as to provide for efficient and equitable interfarm drainage.

Whereas, The clay industries of Iowa now yield an annual output exceeding two and a half million dollars; and,

Whereas, The state is still obliged to import a much larger amount of clay goods, which with the proper scientific development of Iowa clay resources would be unnecessary; and,

Whereas, The state college at Ames has already been of great assistance to the clay industries of the state, but is greatly hampered in this work by lack of funds; therefore, be it

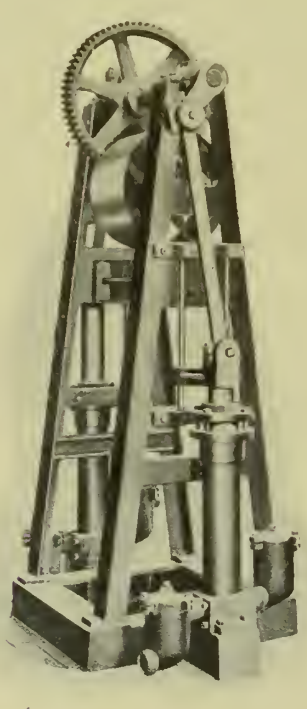
Resolved, That we heartily endorse the asking of the present legislature, and we strongly urge the legislature and the trustees of the college to provide funds to the amount, at least, of $10,000, for the construction and equipment of a building for ceramic work with ample annual support, for carrying on investigation, along this line.

A resolution of thanks was also given the Globe Machinery & Supply Co. for the courtesies extended to the convention. A vote of $25 to the secretary for his efficient work on the association's behalf was proposed and unanimously carried.

Prof. Beyer asked the convention to hold its next meeting at Ames, when the new building would be completed, and he promised them a cordial welcome. This proposition was unanimously accepted. The convention then adjourned sine die.

The C. W. Raymond Co., Dayton, O.

We have recently received from the C. W. Raymond Co., Dayton, O., a catalog comprising 25 sheets illustrating the many lines in pottery machinery the company is now placing on the market. No



DUPLEX SLIP PUMP.

greater sign of the future prosperity of the country and of its advance along the lines of clayworking excellence can be witnessed than by the extensions of our prominent manufacturers of brick machinery and in the manufacture of machines for pottery works. In a recent report on our pottery trade relations with England there has been a marked decrease of several hundred thousand dollars during the past eleven months, which shows that the United States is making more and more of its wares at home, and we understand that this decrease will in all probability continue. On the other hand, potteries are going up and the machine men are

COMBINATION OF THREE 6-FT. GLAZE MILLS AND TWO 4-FT. COLOR MILLS.

doing a roaring business. Among the special machine lines supplied by the C. W. Raymond Co. may be mentioned bench jollies, basin and jumbo jollies with pull downs, plungers, chaser mills, slip pumps, pug mills, grog pans, decorating stoves, printing presses, whirlers, glaze mills, filter presses and kiln doors. The company reports activity in all of its lines and the prospects for the year 1902 are more brilliant than ever before in its history.

Our illustrations show two of this company's machines, a duplex slip pump, and the combination of three 6-ft. glaze mills and two 4-ft. color mills.

Death of William Stead.

William Stead, the veteran brick manufacturer of Waterloo, Ia., head of the firm of Wm. Stead & Sons, was stricken with apoplexy on the morning of January 16th and died within a few minutes. Mr. Stead, who has been in the brick business continuously for 42 years, was born in Cambridge, England, Aug. 10, 1838, and came to America at the age of 14. He was located at Detroit for eight years and then went to Waterloo, where soon afterward he married Miss Matilda Duke, of Cedar Falls, who with four children survives him. In the death of Mr. Stead "Brick" suffers the loss of a good friend.

The new West Baden Springs Hotel now under construction will require 7,500,000 brick; the building will be entirely fire-proof.

The Big Hill Brick & Tile Co., proposing to operate a plant at Tile Works, a small station on the Davenport, Rock Island & Northwestern Ry., in Iowa, has been incorporated with a capital stock of $75,000, and may acquire and conduct the business of Heavlin & Martin. William E. Martin is one of the directors.

The Troy (N. Y.) Paving Brick Co. is in process of organization with a capital of $100,000, and projects the erection of a large and modern plant at Canal and Fifth Aves., in Troy. A. H. Davitt is the principal stockholder and promoter. It is estimated that the buildings and their equipment will call for the expenditure of $75,000. The shale and clay which the Troy company proposes using has been carefully tested at the Rensselaer Polytechnic Institute with satisfactory results. The output of the new works will probably be 50,000 paving brick per day.

St. Louis Letter.

Business has been pretty fair here during the last month and brickmakers and other clayworking industries have had no reason to complain.

While there has been something of decrease in actual contracts, there has been considerable estimating on future work, which will develop in the near future.

The report of the building commissioner for the year 1901, shows an increase over the year previous of $7,291,007. The increase has not been confined to the value of the improvements, but to the number as well, for there were 1,209 more permits issued last year than in 1900.

The largest permit issued during the twelve months was that granted the promoters of the Friede aerial globe scheme. This of course materially increased the value of improvements for which permits were issued, but even without it the year would show a big increase.

The following is the comparison of the two years:

	1900.		1901.	
Months.	Permits.	Values.	Permits.	Values.
January	169	$421,988	224	$1,295,213
February	153	534,478	202	686,644
March	215	424,996	312	911,988
April	239	579,353	333	727,522
May	171	411,231	359	1,296,354
June	178	296,910	346	1,342,104
July	210	441,727	322	1,498,283
August	252	628,366	347	785,171
September	220	275,096	328	542,291
October	284	538,029	387	1,012,819
November	212	560,278	338	759,307
December	210	804,534	224	2,350,301
Total	2,513	$5,916,984	3,722	$13,207,991

The passage of the Charter Amendments which was mentioned in the January issue, caused a number of changes in the plans of the street department and the showing of actual work in that department was kept down. Even under those conditions, 25 miles of construction and reconstruction of streets were completed, many of them being of brick.

Several miles of street construction, in a majority of which brick will enter largely, were submitted to the street department January 14th. A meeting of this department will be held hereafter every two weeks, at which meetings more paving of streets will be considered.

The sewer department was also busy in 1901, and about ten miles of district sewers were built. During 1902 a great many miles more will be built, some of them very large ones. This will become a necessity because of the need for more drainage.

As a necessary preliminary to advertising for hearings on street construction, the specifications for vitrified brick, were somewhat changed. The former requirements for a mechanical "rattler" test were removed, and now it is prescribed that the street department shall make such tests as the street commissioners shall deem necessary to secure the durability of the brick.

H. L. Mathews, chief draftsman in the sewer department of the city, has retired to become assistant general manager of the St. Louis Terra Cotta Co.

The Jonesburg Clay Co., with a capital stock of $25,000 paid up, has been incorporated here. The incorporators are: Chas. Dixon, Chas. W. Kuntz, T. D. Pugh, Frank F. Blades and Thomas Finn. Each has 1,000 shares.

At the annual meeting of the Christy Fire Clay Co., held January 16th, Calvin M. Christy ws elected president; W. C. Morris, vice-president and general manager; Franklin P. Jones, secretary and treasurer, and these with Jos. M. Thomas and Chas. T. Farrar directors.

The St. Louis Vitrified & Fire Brick Co., has filed a certificate of increase of capital from $75,000 to $100,000. The assets are stated at $106,612.92 and the liabilities at $30,028.75.

The Choctaw Pressed Brick Co. was incorporated a few days ago at South McAlester, I. T., with a capital stock of $50,000. Half of the stock is held by St. Louisans, among them H. H. Keller, who holds 600 of the 2,000 shares. The clay which will be utilized lies within the confines of South McAlester, and after thorough test has been pronounced equal to any in the United States.

Th following statistics show the increase in building statistics in eleven cities in 1901. It shows the standing of St. Louis.

City.	Buildings.	Cost.	Per Cent over 1900.
New York	5,705	$129,285,962	73
Chicago	6,053	34,962,075	83
Philadelphia	8,772	29,509,680	41
St. Louis	3,722	13,207,991	123
Cleveland	3,136	6,215,782	60
Buffalo	1,058	4,338,801	23
Cincinnati	4,198	3,515,450	82
Pittsburg	1,515	19,596,602	79
New Orleans	1,797	2,221,273	51
Detroit	2,664	5,977,400	44
Washington	3,103	7,627,463	27

The price of brick remains the same: Merchantable brick, $7.25; ordinary brick, $7.75; strictly hand brick, $8.75; red pressed brick, $17.50; sidewalk brick and paving brick, $8.50, delivered.

Most of the brick yards have closed down for repairs, and will remain closed for several weeks, until everything is in shape for a resumption of work.

An arch in a brick kiln being erected at the Laclede Brick Co's. plant caved in a few days ago and severely injuried several workmen.

Frederick Heman, one of the oldest brick manufacturers in the city and a member of the Merchants' Exchange, died of grip at his home No. 1817 Leffingwell Ave. this week. Mr. Heman had been ill less than a week.

A Chicago Engineer for the St. Louis World's Fair.

Phillip John Markmann, M. E. of the Louisiana Purchase Exposition Co's. department of works, who will plan the construction details of the big exhibit buildings, has exercised a lasting influence on the building construction of the city of Chicago, in which city he has made his home for a decade or more. Numerous skyscrapers rear their heads as a testimony to Mr. Markmann's engineering skill, and among the most notable of these are the Schiller, Stock Exchange and the Montgomery Ward buildings. The last mentioned has a tower 400 ft. high crowning its twelve stories. The tower is surmounted by a bronze decorative figure 10 ft. in height, so balanced on ball bearings that it forms a weather vane. This building is constructed to carry a live weight of 300 lb. per sq. ft.

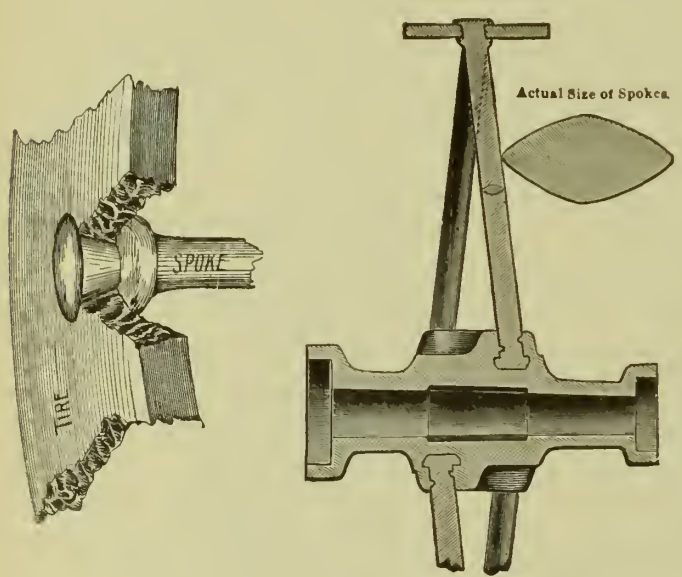
Mr. Markmann was born in 1857 in the Grand Duchy of Baden, Germany. He graduated at the high school of Manheim on the Rhine, and completed his civil engineering education at the Polytechnic School of Stuttgart, the capital of Wurtemberg. In 1882 he came to America and located in Chicago. He spent three years here as a draftsman in an architect's office and was estimator for a big foundry. In 1885 he went to Louisville, Ky., as chief engineer

for the Snead & Co. Iron Works. The World's Columbian Exposition brought Mr. Markmann back to Chicago. In 1894 he opened an office here in Chicago as structural and mechanical engineer. In this capacity he designed the structural work of the new Bank of Commerce building now in course of erection in St. Louis, of which Isaac S. Taylor is architect. It was this work which secured for Mr. Markmann his present engagement.

The Electric Wheel Co., Quincy, Ill.

There is possibly no question which comes before users of vehicles of every description which is of greater importance than that of good wheels. It is often said there are wheels within wheels, and the man who buys a wheel of doubtful quality takes it for "weal or woe," very often the latter. The Electric Wheel Co. is taking time by the forelock and throwing itself vigorously into the good roads cause by placing on the market broad wheel tires made of best wrought steel and guaranteed not to break in the coldest weather or on the rockiest of roads. The chief detriment to a road is the use of narrow tires in haulage. No matter how good the road, a narrow-tired wheel will cut it up as a knife cuts cheese, while a wide-tired wheel helps to keep a road in a good condition. The advantages of good roads to the farmer have been often placed before our readers when referring to the progress of the Good Roads movement and the saving in haulage is considerable.

It is claimed for the "Electric" steel wheel that it embodies all the improvements that scientific ingenuity can depise. Experiments



have been made by the company with malleable hubs, steel hubs, brass hubs, and cast-iron hubs with suspension and tangent wheels and with straight and staggered spokes. The wheel presented in the illustration is the company's idea of a wheel as near perfect for strength, weight and durability as can possibly be manufactured. Fig. 2 shows the spokes as they are cast in the hubs. The hub is made of cast iron and will hold the spokes sound and tight as long as the wheel lasts. They are securely fastened in the tire, a large nut on one side and a large shoulder on the other. This is done when the spoke is at its welding heat, obviating the danger of crystallization which takes place when the spoke is riveted cold. The heads of the spokes are countersunk clear through. The catalog issued by the electric wheel covers some 50 pages, is carefully illustrated, and places before the public all the different kinds of wheels, wagons, trucks and springs manufactured by the company, and explicit directions are given for taking measurements when ordering and good advice as to the best methods of purchase for the purpose required.

New York Letter.

The following extract from the annual report of H. T. Beach, consulting engineer of Syracuse, N. Y., has served to arouse the advocates of web tile and of brick for sewers. Mr. Beach says:

"Web tile is a single cell with an inside and an outside wall about an inch in thickness, giving an area to resist crushing about equal to a single brick on edge, while experience has shown that a single ring of brick laid flat is not strong enough for a sewer of this size. In addition to this fault of design, the blocks vary widely in hardness, and the size of the blocks varies within certain limits with the hardness, growing smaller as the extent of burning increases. Attempting to lay these irregular sized blocks to make a definite size of a sewer, it is impossible to keep to the true lines with parallel beds and uniform thickness of joints, consequently a greater strain is thrown on the outer or inner wall, the sewer is thrown out of its true form and irregular and undertained strains are produced, which make the structure unsafe. In this sewer also the workmanship is inferior, apparently little attempt was made to secure any end joints or the longitudinal joints near the crown of the arch or to point up the joints after several sections were laid. I examined about 100 ft. of supposed completed sewer and found it out of line. Under these conditions it is no wonder that the sewer failed as it did in two places and probably will in others, in fact it is not in the present condition a sewer at all, but merely an underdrain to the street. In my opinion it can never be made a proper sewer without rebuilding the tile portion of it with brick."

Owing to this report, the property owners interested in the Brighton Ave. sewer, have taken steps to have the contract for web tile rescinded and re-let for brick. Friends of web tile do not like the report of the consulting engineer and say that web tile is as good if not better than brick, and that it will continue to compete with brick.

A little over half a mile of brick pavements were laid in Syracuse last year. Syracuse now has 40.60 miles of pavement as follows: asphalt, 26.56 miles; brick, 7.94 miles; asphaltina, 3.60; sandstone block, 1.71.

The New York Brick & Paving Co. has borrowed $75,000 which will be used for the installation of new machinery and the building of an addition to the plant.

The Paragon Plaster Co. is enlarging its plant by taking on a space of 100 by 200 ft., which will be used for a sand and pipe yard and give increased shed room. New machinery will be added and more men employed. The company is also spending a large sum in improving its plant on the Black River canal.

The Adamant Plaster Co. has spent $12,000 in improving its plant at Hastings-on-the-Hudson and the Syracuse plant located in the eastern part of the city is also being improved. The year just ended has been a prosperous one and the prospects are good for another big year next year.

The Vulcan Clay Co., of Wellsville, O., of which P. M. Smith is president, has increased its capital stock from $24,0000 to $40,000.

The Granite Clay Co., which operates a 10-kiln sewer pipe works at Mogadore, O., has increased its capital stock from $100,000 to $250,000. The company's general offices are located at Akron.

CORRESPONDENCE.

By reason of its large circulation "Brick" offers exceptional advantages for the exchange of information on practical subjects in which the clayworker is interested, and we urge our readers to avail themselves of the "Brick" correspondence columns, and lay their questions and troubles before their fellowworkers, some of whom are almost sure to know the best solutions for the problems. All answers which we can print will be paid for at our regular rates. Where the subject permits of it a sketch or drawing will often add greatly to the clearness of the answer.

A CORRECTION.

By an unfortunate mistake in editing the letter from F. M. Gardner published in "Brick" for December, 1901, page 282, we quoted Mr. Gardner as saying that Robert Nesch's brick yard at Pittsburg, Kan., was for sale. This is not the case, the plant for sale being that of the Pittsburg Clay Co., now in charge of F. B. Wheeeler, receiver.

There are at Pittsburg, Kan., three clay plants. The Pittsburg Vitrified Brick Works, owned by Robert Nesch, has had a prosperous business with all the orders it can fill. The Pittsburg Hollow Block & Pipe Co. has also had a satisfactory business. The Pittsburg Clay Co., making terra cotta, is reported as being strictly modern in its equipment and a bargain for parties wishing to invest in this part of the country.

SORRY TO QUIT.

Editor "Brick": Please discontinue sending me "Brick" when my subscription expires; I have been out of the clay business for five years and have not now the time to keep posted on clayworking literature. I cannot imagine how anyone engaged in the clay industry can have any measure of success without being a subscriber to "Brick". The reports of conventions, to say nothing of the many technical articles you publish, are alone worth to any practical clayworker many times the price. With New Year's congratulations and best wishes for continued prosperity, I remain yours truly.

John McDivitt.

Editor "Brick": Your January number was certainly very fine and contained a great deal of valuable reading. I have been reading a lot of your journals lent me by a friend. Judge Thomas, of Port Huron, and arrived at the conclusion that every brickmaker should have "Brick" on his table. Enclosed I send you $1.00 for my subscription. Yours truly.

Yale, Mich. John H. Merrill.

DON'T LET IT HAPPEN AGAIN.

Editor 'Brick": Will you please send me "Brick" again? I had you stop it for me, but regret it, because I cannot do without "Brick" any more than a man who uses tobacco can quit that habit. Enclosed find $1.00. Yours truly,

Richwood, O. M. J. Scheiderer.

SO DO WE.

Editor "Brick": Enclosed find check for $2.00, for which continue to send me "Brick" for this year, and send a copy for one year to Luther Doster, care H. Stevens' Sons Co. I think it is the best paper of its kind published. Yours truly,

Macon, Ga. J. E. Minter.

WANTS STIFF-MUD MACHINERY.

Editor "Brick": So far in our plants we have employed only the soft-mud and dry press processes, but we believe that we shall need to install some stiff-mud machinery. I am also interested in knowing the best machinery for pottery works and would like to have the manufacturers of pottery and stiff-mud brick machines mail me their catalogs care "Gran Fabrica de Ladrillos Reprensados, S. A., Hacienda de Pardo, San Luis Potosi, Mexico." Yours truly, Manuel Hernandez.

BRITTLE BRICK.

Editor "Brick": We have trouble with our brick by reason of their coming out of the kiln in a brittle condition. We have tried burning with coal and with wood; we have tried slow firing and fast firing with about the same results. It may be in the clay formation, and possibly we have not struck the correct combination. The bank consists of first, 12 in. of black soil; second, 24 in. of alkali; third, 30 in. of clay; fourth, 10 in. of gumbo or joint clay; fifth, 5 ft. to 6 ft. of clay and sand with lime pebbles. Would the alkali streak cause the trouble by reason of putting too much lime in the bricks, and would any addition counteract the effect? Can you place me in touch with clay chemists who can make analysis and give advice? L. L.

[We are not quite clear as to what is meant by the 24-in. stratum of alkali, but presume that it is a clay and lime mixture. It is probable that this strip and the lime pebbles in the bottom stratum would be sufficient to make the bricks brittle. We would suggest that L. L. try making some bricks using only the clay and the gumbo. Reference to our advertising columns will give the names of reliable chemists.—Ed.]

Editor "Brick": We would like to ask through the columns of the Brick the reason why the hollow block we made split up the sides in burning. We made three kilns of blocks before we saw how they were splitting. We had burned the block in small quantities in brick and tile kilns and they did not split, so after the first kiln of block was taken out (and there was not a sound block in the whole kiln) we had another kiln ready to burn, and the third kiln made. Now on these two kilns we were as careful as possible, but without results, as they split as bad as the others. We started to burn them very slow, and burned with the fire box doors partly open for quite a time after the water smoke was off, but every time we would try to increase the heat a little the block would begin to split—they made so much noise you could stand some little distance from the kiln and hear them cracking. We have no trouble to make good brick or drain tile from the same clay we used for block. We burn our ware in open bottom down draft kilns and set the block in the kiln on end. The block we make are 12 in. long, 8 in. wide and 4 in. thick, without partition wall. B. H. R.

[It is difficult to say from the data given to exactly what cause the trouble is due. It might be because of defective dies on the machine, because of imperfect drying, because of lime or other impurity in the clay, or because of the method of setting in the kiln. The noise referred to would indicate the presence of lime, but since perfect blocks were burned in the brick and tile kilns the trouble is perhaps due to faulty setting in the block kilns. We would refer B. H. R. to the article on "Setting and Burning Hollow Block," by Mr. Fuetterer in "Brick" for January, 1902, page 26, and suggest that he carefully compare his method with those there recommended.—Ed.]

WANTS BRICK YARD EQUIPMENT.

Editor "Brick":—We have recently secured orders for 1,500,000 building brick, of which 1,000,000 have to be shipped to Pueblo. Another 500,000 brick will be required for use in our city, and we are obliged to increase the capacity of our plant to meet the heavy demand for our products. At a recent meeting of our board of directors an appropriation of $10,000 was made for the purpose of installing a vitrified aving brick plant, comprising additional machinery., buildings, driers, down-draft kilns, etc. We should be pleased to receive from your advertisers propositions on stiff mud machinery, driers and kilns. Yours very truly,

Trinidad, Colo. Trinidad Brick & Tile Co.

NEWS FROM CANADA.

Editor "Brick":—I have just received your January issue of "Brick," and I am very well pleased with it; it is far above my expectations. I would not be without the information it gives. Our plant is, of course, on a much smaller scale than some of those described in "Brick." We have a Kells machine, and make wire-cut brick and tile, both white and red. Our white brick compares in quality with any other made. Our yard is of the old two-row, 10-high system. We burn in open kilns, obtaining pretty good results, and we also have one down-draft kiln for burning tile. Our drying hacks have a capacity of 10,000 per day, but our making capacity will produce that quantity in from five to six hours. We have an inexhaustible supply of clay, which we do not work below 20 feet deep. It is of uniform quality throughout. For fuel we use wood, which is not very expensive here, only $1.50 per cord. We sell soft brick at $4 per M and hard brick at $6.50 per M, which gives us a good living profit. Our season's output ranges from 800,000 to 1,000,000 brick and from 100,000 to 200,000 tile. Our season is short, only about five months, but as our business is growing rapidly in this part of the country we expect before many years we will double our output and will be able to send you items concerning a much larger plant. We ship brick as far as Goodrich, Brussels and Wharton on the Grand Trunk, and these shipments are continually increasing. Yours truly,

Paisley, Ont., Can. Robert Bell.

A new brick plant will be erected at Blossom, Tex., at a cost of $30,000.

Brickmaking will be added to the industries of the state reformatory at Green Bay, Wis.

The New Jasper Stone & Pressed Brick Co., of Xenia, O., has been incorporated with a capital stock of $30,000.

The Blandford Brick & Tile Co., of Russell, Mass., has resumed operations and is turning out large quantities of firebrick.

The McGowan Conduit & Tile Co. has been incorporated at Camden, N. J., with an authorized capital stock of $200,000.

The Suburban Brick Co. has begun rebuilding the Belmont plant at Martins Ferry, O., which was recently partly destroyed by fire.

The two brick plants at Gladbrook, Ia., have been running this season at their full capacity to meet an exceptionally heavy demand.

The Baltimore Brick Co. has reduced its bonded indebtedness from $1,500,000 6 per cent bonds to $1,000,000 5 per cent bonds. Preferred stock has been issued to make up the difference to the holders of the bonds who are largely the original underwriters.

The Blossom (Tex.) Brick Co., capitalized at $30,000, has been incorporated by G. W. Campbell, L. J. Campbell and R. V. Womack.

Heckard & Son, brickmakers of Canton, Ill., will furnish 10 car loads of brick to be used in the erection of the Western Tile Works at Kewanee.

Fred Donaldson, proprietor of the brickyards at Yankton, S. D., will increase the capacity of the yards to 100,000 brick per day. A new artesian well will be sunk.

Bartlett Brothers, who opened a large brick plant at Lead, S. D., last summer, are preparing to extend and improve it. A new drying room with a capacity of 30,000 will be added.

J. P. Sunde, of McCallsburg, will erect a pottery plant at Marshalltown, Ia., in the spring, at a cost of $16,000. A site has been purchased and the stock subscribed by local capitalists.

The Morrison-Trammell Brick Co. of Rome, Ga., is reported to be in the market for a complete brick works equipment, including pug mill, disintegrator, cutting table, boiler and engine.

J. E. Whiteselle, manager of the brick works at Corsicana, Tex., has shipped several car loads of brick to be used in the erection of the new Trinity University which will be one of the finest buildings in Texas.

The Mount Holly Brick & Clay Co., of Mount Holly Springs, Pa., has increased its capital stock from $250,000 to $300,000 and will use the proceeds in extending its plant to meet a constantly increasing demand.

The two brick plants at Table Rock, Neb., have been running at their full capacity for the entire season, but still the demand for brick has exceeded their output. It is reported that a third plant will soon be opened in Table Rock.

The Renton (Wash.) Clay Works Co. is making rapid progress in the erection of its buildings. A complete mechanical equipment, valued at $40,000, is to be installed, and it is expected will be ready to begin operations by March 1st. The product will comprise vitrified brick, terra cotta, drain tile and sewer pipe.

The Morris Brick Co., projecting the erection of a large brick manufactory at Atlanta, Ga., has applied for a charter. The incorporators are: E. D. Morris, Stephen E. Simmons, W. M. Jackson and Thomas Wood. The company has a preliminary capital stock of $10,000 with authority to increase its capitalization to $50,000.

The new brick factory at Clay Center Kas., has been put in operation with a capacity of 100,000 brick per week. Deposits of blue shale and red clay are abundant and the product of the new plant has been pronounced equal to any in Kansas. Lewis Kreeck is president of the company, and William Docking, secretary and treasurer.

The Fombell (Pa.) Clay Manufacturing Co., capitalized at $100,000, has applied for a charter under the laws of New Jersey, and projects erecting immediately a large plant near Fombell, in Beaver County. The buildings will be erected at a cost of $60,000. W. G. Clark, of Beaver County, A. G. C. Rhodes, formerly of the American Tin Plate Co., and M. I. Jacobs and Herbert Carlton, of the United States Securities Co., are principally interested.

Wisconsin Clayworkers' Association.

Second Annual Convention at Milwaukee, Jan. 28-30, 1902.

The Wisconsin Clayworkers' Association held its second annual convention at Milwaukee, January 28, 39 and 30. This association held its first meeting last year at Madison with most satisfactory results and adjourned with bright hopes for increasing attendance in 1902. These hopes and expectations have been realized beyond all dreaming, for there was an increased attendance, the local brickmakers entertained the visitors with the greatest of hospitality, and the papers and the discussions were of an exceedingly high character, one or two of the papers deserving to take their place as classics in clayworking literature. The weather was, on the whole, favorable, and added greatly to the pleasure of the visiting clayworkers. Already there have appeared in their midst certain types of "brickies" whose memories are destined to be cherished from year to year. What would Wisconsin be without Finnegan, or Hinkley, without Drake, Chase, Burnham or Schwartz? These men, all of them typical brickmakers evinced a spirit of good will and geniality which permeated the whole of the proceedings of the convention and it is just these types of men that contribute to the life of an organization.

The attendance showed a decided increase above last year and from no one could be heard a complaint as to the business of the present year or the prospects for the future.

On Tuesday evening the clayworkers and their wives were entertained at a theater party and on Wednesday evening a complimentary banquet to the visiting members was given by the Milwaukee brick manufacturers. Clifford Chase, of Milwaukee, was a most efficient toastmaster and after a sumptuous menu the proceedings were enlivened by story and song to the gratification and delight of all present. The convention adjourned at noon on Thursday, January 30th, and in the afternoon a number of clayworkers visited the brick yards of Burnham Bros. and Chas. Kraaz where the continuous kiln of Mr. Youngren and the Boss method of burning by forced draft were inspected.

The next convention will be held at Green Bay, Wis., and the fact that Green Bay is the home town of Messrs. Hinkley and Finnegan is a sufficient guarantee of a successful convention.

The convention badge was the most ornamental ever issued for either state or national convention. It had a dark blue ribbon lettered with gold, a badger pin on top recalled the Badger State and a brass medallion showed the state arms on one side and on the other the Milwaukee lake front. It was greatly admired by the visiting members.

PRESIDENT'S ADDRESS.

By E. W. Drake, Milwaukee.

I wish to congratulate you upon this auspicious beginning. When we remember that this association is not quite a year old, and when we look at this splendid convention, it makes us feel like prophesying great things for the future of this association.

In the space of time allotted to me, I wish to consider the clayworking industry in comparison with the many industries connected with building material, and I shall not enter into details of management or methods of operation for on the program tomorrow there will be gentlemen who will tell you how to make, burn and market your product, or anything else that you may want to know; in fact, more than you or they ever knew or dreamed of before. For this is the winter time, and who ever knew a brickmaker who did not know more about making brick in the winter time than any other man on earth. But today I want to look at our business in its relation to other lines of industry. Of its past we shall not say much, although it is exceedingly interesting. For recent research, as it unfolds to us the history of the past, proves clearly that burned clay is among the most enduring products of nature's creation or of man's handiwork, and, because of the enduring qualities of burned clay, it has been the means of bringing down to us much of the early history of the ancients, and thereby added a new interest in the life and pursuits of the fathers of the race. In comparison with other materials used for building purposes, our product is far in advance of them all; wood is short-lived at best; iron will rust, corrode and crystallize, and even granite succumbs to the disintegrating elements; but we know that, above and beyond them all, burned clay has stood the ravages of time, and that from the misty morning of earth's first day, down through the ages of a buried past, brick has been the one enduring substance upon which man has recorded the rise and fall of civilization long since forgotten. And because of these qualities of endurance and usefulness, the industry has been recognized in all ages as one of much importance.

In the time of Egyptian and Assyrian supremacy and later in the Roman ascendancy, brickmaking was under governmental direction and was looked upon as a necessary part of the civilization and advancement of those respective nations. The higher the scale of progress, the more perfect was the art of brickmaking and the more important a place was it given. In our own time, as many of us have watched the growth and development of the clay-working industry as it advanced from the present hand processes in the backwoods, under all the discouraging influences and hindrances thereunto up to the present time, when continuous kilns, steam shovels, hot blast driers, and a vast amount of machinery are the equipments of most yards, all of which have been the means of making the brickyards one of the important factors in the growth of any city, and have placed the manufacturer among those prominent in the advancement of organized society. And so I recognize that today I am talking to business men, who are representative men from the several localities from which you come, and as such you are worthy and representative citizens of our great state. And I trust that while here, some thought suggested in this or some other paper on the program will give you an inspiration which will be the means of a determination on your part to excel in your chosen vocation.

As a business proposition, gentlemen, do we realize the importance of excelling? You know the old adage which says: That which is well bought is already half sold," and the same principle is true in the clay-working industry: That which is well manufactured is already half sold, and especially so when competition is keen. For this is a progressive age, demanding the very best, and being satisfied with nothing less. If there ever were a time when the exemplification of the truth, contained in the principle of the survival of the fittest, asserted itself, it is today, as it applies to the products of this industrial and commercial age.

Because of the superiority and fitness of American products, the markets of the world are opening up to us in a wondrous way, and do not for one moment think that because your market is in some instances local, you are liberated from the above rule. We must keep pace with the demands of the hour, or without our knowledge or consent we shall be superseded, and others with more energy and a more competent conception of the wants of the people will come in and replace our product with something else. The whole possibility before us does not lie in the making of one article alone.

Acquaint yourself with the needs of the present time, and rise to the opportunity they offer. The pendulum of commercial and industrial life today is swinging toward vast achievements, made possible by concentrated action, corporate supremacy and co-operation, the keynote of the hour. He who does not recognize this fact will lose in the race. Concentration of forces, for mutual benefit, is the thought, while heretofore, in many instances, it has been concentration of force for demoralization. For instance, a keen competition, carried too far, will result in war of prices and of interests, which, like all other kinds of war, proves disastrous, will likewise prove a waste even to the one who is victorious. Rather use the means which gives added power to accumulative force, to the direction of vast enterprises by the ablest minds under the most successful methods, and to the bringing to your business not only your own ability, but the ability which every other man in your especial line of business possesses. This does not mean that you must go home and place your business in a trust or combination, not by any manner of means, but it does mean that for the best interest of our business we must get in touch with the most advanced thoughts of the day, either through the current literature, which is abundant, through the experience which is brought out in gatherings of this kind, or through the methods which today are applied to nearly all kinds of business.

We must apply the principles which underlie the improvements of the time. You know the Irishman is quoted as saying: "Nothing succeeds like success," and it is true, for the methods applied to business which succeeds are the methods from which we can expect success. Gather the best results from the experience of others, and apply them to your own conditions. Do not be afraid to copy that which is good and practical. It may lead you to improvements which would never be made without the hint from some one else to guide you. Look favorably upon new improvements in machinery. Do not think that every agent who approaches you or wishes to talk new machinery is trying to swindle you. Investigate; of course you must have a mind of your own on matters like this. But remember that we are much indebted to machinery for the advancements in the art of clayworking. Encourage the efforts of those who are giving of their ability, thereby helping to make our product better than before.

Use the facilities for improvement which are at hand, for they are numerous today compared with those of other decades. These facilities, namely, the press, the geological survey, the information furnished by our school and colleges, the work of the ceramic societies, the general discussion of conventions, and the experiences of your neighbors as they relate to the clay industry are all laboring with one end in view, and that is a higher intelligent conception of what it means to transform a quantity of clay into a thing of beauty and usefulness, rememebring at all times that he who carries to the highest perfection his special vocation in life not only benefits himself, but gives to the world an added impetus toward the goal for which we are all striving, and confers upon mankind a lasting benefit. For that one who, inventing something new, thereby sets idle hands to work, has done more good in a practical way to help mankind than he who merely gives his wealth to the poor but does not help them to build for themselves.

The clayworking industry is of necessity one of vast importance. Wherever the pioneers of civilization have led the way, and were obliged to use perishable material for present habitation, it was only a temporary guide-post, pointing the way to that which was to follow. For when the marts of trade were established and great enterprises made possible the accomplishments and comforts of mankind, then the enduring product of our kilns was brought into use, and as the homes were reared and great structures marked the sites of prosperous cities, they all, with one accord, told the story as do the beauty and solidity of our own "Cream City of the Lakes," in its unlimited testimony to the necessity of clay products. In the building of any great city, all that is beautiful in thought or artistic in design has been made to sing in mute yet in no uncertain sound. The praises of our product, in fact, the brightest minds of this world's production, have in their times chosen to perpetuate their conception of the beautiful through the great edifices that have marked the advancement of the race. And the architectural monuments that have been the pride of mankind have likewise been a witness to the enduring qualities of brick. And at no time has there been a more urgent call for the best and most practical building material than now, and never was the usefulness and necessity of our product more forcibly recognized. And if we would keep this fact in the mind of the architect and builder, it must be because we make our product indispensable to them.

Make the product of your kilns, gentlemen, so good and, thereby, so necessary to the builder, that it will be almost impossible for him to construct the abodes of man without your assistance. For is it not patent that more and more the world will recognize clay products as the only building material of the future? As wealth becomes more abundant, and stability more sought after, wood, as a building material, will give way. Iron is not practical, except in the sky-scrapers of the city, and then the users thereof will have to call upon us to clothe their skeletons for them, and when it comes to all other edifices, that which will endure the longest, that which is the most comfortable, that which is as cheap as other materials of a lower grade, that which is ornamental and beautiful will take its place. And when we have all these qualifications combined in one, that one is destined, beyond a doubt, to become the universal choice of builders. The future generations may see a scarcity of those materials like wood, iron and stone in the localities where they now abound, and to transport some of them would mean an exorbitant price. But when we see how kind and generous, aye, even how lavish nature has been to the clayworker, we know that our product can never be exhausted. For when the Creator flung from his puissant finger tips this old world into space, he must have had a special thought concerning the future clayworker, for so lavishly did he provide for us, that there is no limit to the amount of material placed at our disposal. But let it not be said by our posterity that we have abused our advantages, or that we are behind the times in which we live; rather, let it be said by those who, in years to come shall read the signs of present advancement, that this epoch in the world's history was one of great importance to the clayworking industry, and as we shall labor to put our profession on a par with any of the important industrial or commercial occupations of this wonderful people in this wonderful age, we shall do so, knowing that we have just cause for being proud of the record of the past, and bright with expectancy for the future. But the future can only be made bright by our continual advancement, and that with a continual persistency which will command attention and win respect.

Is not the fact that the endurance of burned clay is one which is little understood? Are not the masses too apt to classify it in comparison with wood and other perishable materials? Would it not be an advisable thing to do, to publish a work dealing with this subject in the light of revealed facts? Does the world appreciate the fact that we are manufacturing a commodity which is the most enduring of all materials? Would the builders continue using wood if they truly realized that at best it was but a perishable article; while we offer, at about the same price, a commodity which, if properly constructed will last while ages come and go, and is as enduring as the very hills from which it is made. But all the honor does not accrue alone to him who manufactures the material from which the happy homes and business establishments of our land are reared. We are just beginning to realize in this country the great importance of proper drainage. We have had so much land under our control that we have not seen the necessity of making the little produce the much. But as the population in-

creases, and the large farms are divided up, and we touch elbow with our neighbors more closely than ever before, then we shall begin to understand the importance of putting the soil in such a condition and helping it by all means under our control, so that it shall be described, as was a land of old, "a land flowing with milk and honey." In order to do this, the tile machinery will become busy and profitable as well. I dare say there is not one among us who has not a high ambition, a noble purpose, an ideal, to which we are striving. We are told to aim high above the mark we would hit, or, according to the laws of gravitation, we will strike below the mark. So in the clayworking industry let us aim at perfection. Is it too high? Certainly not to aim at. Let each man's yard be a likeness of his individuality; leave your impress on your surroundings; put your personality into your product; and bring forth that which shall be an imitation of your own life and character. Now this does not imply that you have got to be a "brick," as the term is sometimes understood by the boys, but that the stability of purpose, possessed by you, shall be reproduced in that which you manufacture. Elevate that which you come in contact with, thereby making your occupation a necessity to that community in which you live and labor. It has been a necessity in all the ages of the past, ever since primitive man undertook to climb above the clouds, over a pile of brick and mortar. Your vocation has been one of the important enterprises of mankind. And shall not an industry so time-honored and useful, hold the first place among the many enterprises of the world? And as a higher conception of its importance comes to us, in this noonday of earth's great achievements, shall we not unfurl our banner, marching in the very van of the industrial hosts which today are striving to make our land blossom like a rose, our people prosperous and happy, and our flag, the proudest and best of them all.

OUR EXPERIENCE IN THE MANUFACTURE OF SOFT MUD BRICK.

By F. L. Sanborn, Portage, Wis.

Our first experience in brickmaking dates back to 1880, with soak-pits and horse-power machines. The brick were carried out by hand and dumped on the yard, where they were exposed to the weather until they were dry enough to put into hacks. While on the yard, a hard rain-storm would ruin them, or a hot sun and a drying wind would cause many of them to crack, so that at times the loss would be quite heavy. We burned our brick in a clamp-kiln, scoved up with a wall 8 in. at the bottom and 4 in. at the top, plastered with mud. Brick were set 3 on 3, with 3 brick benches, 36 brick high.

After a few years we put in a steam-power machine made at Haverstraw, N. Y. While using this machine we were very much annoyed by the brick sticking in the molds; they would not dump readily on the yard. While using this machine we ran out 20,000 in the forenoon. In the afternoon we hacked brick, hauled clay and wheeled brick to the kiln. After adopting this plan, in good drying weather we were able to put into hacks during the afternoon a very large percentage of the brick we had run out during the morning, so that but a small percentage of the day's output was exposed to the rain during the night. This of course was a pleasant feature of this arrangement.

About this time we put up solid walls 20 in. thick at the bottom and 12 in. thick at the top for our kilns. These walls were built of bats and refuse brick, slushed in with very thin mud, which made them very strong and durable if kept properly covered from storms and thoroughly braced when burning. We consider these permanent walls much more economical in the end than to scove up and remove the scoving from each separate kiln; besides, we get a larger per cent of hard brick from the kilns. We also put in doors and grates, set 4 brick benches instead of 3 brick benches, and set our kilns 40 brick high. We found by this change that we were getting a larger per cent of hard brick and using less fuel per thousand to burn them.

After a few years, the machines needing repairs, we discarded them and returned to pug mills and hand molding. The mills were turned and clay hauled by steam.

For several years we depended on hand molding entirely, but finally put in a Creager machine and pug mill, and put up sheds and adopted the pallet system, which is very satisfactory. Our loss from storms and cracked brick on the yard is almost entirely overcome. We make quite a saving in the handling of the brick, as the brick are only edged up after they are placed on the pallets in the sheds until they are wheeled to the kiln, while formerly the brick were hacked up, the hacks covered and uncovered until they were dry enough for the kiln. We consider the pallet and shed the most satisfactory way of handling brick for out-door drying.

Our clay is about 16 ft. deep, covered with from 1 to 4 ft. of sand. There are veins of white sand all through the clay, so we get our clay and sand from the same bank. Our clay is quite stubborn, and much of it needs to be crushed, frozen or sun-dried to pulverize it. It requires a very high degree of heat to properly burn it. We use wood and coal for burning, using block coal in the mouths of the arches after the water-smoke is off. Our brick are cream-colored and of excellent quality. We think no better are made in the state.

Our wood costs us about $4 per cord at the kiln. We would like to know if coal or oil alone can be successfully used in this style of kiln. If so, it would relieve us from investing so much money in wood, to lie idle for several months.

Patent kilns, we understand, are quite expensive to start with, and the repair bills are quite heavy.

Our heaviest expense is the burning. We have been very fortunate with our labor, never having been troubled with strikes or lockouts.

Of all manufacturers, we think the brick manufacturer has reason to be proud of his products, as they will endure long after other building materials have gone to decay, a lasting monument that shall be in evidence after he has passed to the world beyond.

TECHNICAL & TRADE LITERATURE AND ITS VALUE TO THE CLAY WORKERS.

By J. W. Hinkley, Green Bay, Wis.

My first impression was that literature had been more indebted to the clayworker than the clayworker to literature, and this was confirmed when I read that "on every brick that was made during the reign of Nebuchadnezzar it was his custom to have his name stamped" and that "Sir Henry Rawlinson in examining the bricks in the walls of the modern city of Bagdad, which is built on the borders of the Tigris very largely of brick from the old ruins of Babylon, discovered on each brick the clear trace of that royal signature." His majesty was at least indebted to the clayworker for having his name handed down to modern days in imperishable material, which distinction he shares with many other kings of Assyria and Egypt. And while it does not appear that any of these ancient clayworkers had a "Technical and Trade Literature" in our meaning of the term, yet there are found printed upon the walls of tombs in Egypt, more than six thousand years ago, pictures of potter's wheels and the potters working with them. Also pictures of the potter's kiln, which forcibly remind one of the advertising section of a modern trade journal.

These pictures give us a good idea of how pottery was made and burned. The kiln was a tall, circular chamber of brick with a perforated brick floor near the bottom and an opening for fuel in the side under the brick floor. The pottery to be baked was piled in the upper part of the chamber. The artist has left us in doubt whether he was advertising somebody's patent kiln in the hope of getting a job to build some more of them or whether he was the editor trying to instruct his less informed brethren how to run the business, or whether it was simply to inform the world that the deceased made pottery. Probably the latter, but in the modern trade journal we have all the three objects combined. Something like three or four thousand years after this Egyptian artist had illustrated the making and burning of pottery in his trade journal a Greek artist near Corinth made a picture of a kiln upon a potter's tablet and this picture has been handed down through nearly thirty centuries to our day.

These old clayworkers were conservative. I think I may say fully as much so as the clayworkers of our own day. The Corinthian kiln differs from the Egyptian only in being covered over. Of course that was some progress, but when we consider it took over three thousand years to make that much advance we must conclude that "Technical and Trade Literature" had a small circulation. Another reason for this opinion is found in the fact that the Greeks claimed the invention of the potter's wheel, and according to Homer various cities contended for the honor, although the wheel was in use by the Egyptians three thousand years before.

Such little "Technical and Trade Literature" as has come down to us from the ancient clayworkers, either printed upon the walls of tombs or stamped or marked upon their clay products, shows that they knew not only the use of the potter's wheel and the potter's kiln in nearly the shape that we use them today, but they attained a perfection in the art of glazing and enameling brick and other ware that has not been equalled in modern times. The trade literature of that time only sufficing to let us know that this work was done; not how it was done.

The Romans as well as the Greeks and Assyrians made bricks and terra cotta. Inscribed tablets have been found in all parts of the eastern countries which are practically books, and whole libraries of these are known, and if they have left no trade literature they have left a large amount of very valuable historical information which is being gradually deciphered from them. The Romans made great advance in the use of baked clay for all useful purposes, making bricks, roofing tiles, floor tiles, flue tiles, drain pipes, baths and even coffins. Glazed pottery has been found in most of the countries occupied by them and clay lamps were very largely used. Great numbers of Roman kilns have been found in various countries but all are similar to the Greek kilns in use a thousand or more years before.

As we come down into more modern times we find but little more trade literature, clayworkers in general being inclined to keep their process a secret as much as possible. In 1671 an Englishman named John Dwight took out a patent for his special methods of making pottery and porcelain. Many of his receipts for porcelain exist and have been published. Since that date there have been many patents granted and much literature published for the benefit of clayworkers, but it has been mostly confined to porcelain manufacture, which is not of especial interest to us. Brickmaking by machinery seems to have developed in the last fifty years and the literature of brick making in the last twenty years.

In the ninth edition of the Encyclopedia Britannica, published in 1888, the process of brick making by methods in use near London, is described as follows: "The molder stands at a table or stool on which are placed some tempered clay in front of him, a little dry sand to the right and left, a small tub of water with the strike in it, a brick mold and a stock board. The brick mold is a rectangular case of sheet iron without top or bottom, having the two sides strengthened with wood. The molder received from the clot molder (usually a woman) a piece of clay somewhat larger than a brick. Having sprinkled sand on the stock board he places the mold and dashes the clay into it with force, then pressing it with his fingers so as to fill the angles." And in the same connection we are informed that substantially the same method is used in France and Holland. In the end, however, this writer says that in recent years there has been great activity in the invention of brick molding machines, but that it is only in brickmaking on a considerable scale that they present any advantages over hand molding. The only guide to the date when this article was written is a description of some brick exhibited in 1874.

In America some excellent brick were made by natives of Peru and Mexico, long before the advent of the Spaniards, and pottery and its remnants are found all over both North and South America. The date when this was made cannot be told, as burnt clay is indestructible and under ordinary conditions will last indefinitely. Less than twenty years ago Charles T. Davis, of Washington, D. C., put out a book entitled "A Practical Treatise on the Manufacture of Bricks, Tiles and Terra Cotta," and in the preface to his book he says: "The manufacture of bricks, tiles and terra cotta, as well as a consideration of the modern methods and appliances by which they are produced, has never heretofore been practically treated in any work." That being the case Technical and Trade Literature, as applied to modern conditions of clayworking, has but a short history. He, however, tells us that the works of Ruskin, Street and others, have revived the taste for ornamental and polychrome brick work so extensively used as a means of external decoration in the highly ornamental architecture of Italy and Germany during the middle ages, until it promises to revolutionize the ecclesiastical and domestic architecture of Europe and America, and that the great advance that has been made in the manufacture of colored relief, molded and intaglio bricks during the past few years now bids fair to rival the standard of earlier days." Much valuable information for the brick and tilemaker was contained in this book and brickmakers who bought and studied it found it full of ideas that were a help to them.

There have since been a number of books published which are helpful to the clayworker, a very complete list of which will be found in the January number of "Brick," and perhaps in other trade papers.

The Clayworker of Indianapolis was, I believe, the pioneer brick trade journal in America. Its first number was issued in January, 1884, and the appearance of its editor leads me to believe that it is a prosperous publication. Other trade papers have followed, "Brick" being founded in 1894, and the field is now well covered. The extreme modesty of the publishers of these trade journals and the diffidence that they display about commending their own work leads me to say for their benefit, that any of them are well worth the subscription price and that I have obtained from a single number information that was worth the price of a subscription for all of them.

I think I can safely say that more real progress has been made in the methods of making brick and tile, and in fact all clay products in the last fifty years, or perhaps I might say in the last twenty years, than had been made in the fifty centuries before. Perhaps we do not make them so very much, if any better, but we make them with much less labor. We make steam do the work of muscle, and may we not attribute very much the largest part of this saving to the general diffusion of information about labor-saving devices by our trade journals. And is it not a reasonable conclusion that the clayworker who does not read a trade journal will fall behind in the race?

Obituary.

John Moses, a prominent pottery manufacturer of Trenton, N. J., died January 21st, aged 67 years.

George B. Perry, a brick manufacturer of North Adams, Mass., and formerly president of the Mechanicsville (N. Y.) Brick Co., died in Boston on January 13th.

Daniel Duty, a pioneer brick manufacturer of Cleveland, O., and senior member of the firm of Duty & Co., died at his home in that city, January 8th. The deceased was the father of S. M. Duty, secretary of the local association organized to perfect arrangements for the coming convention.

J. W. Gunkle, of Indianapolis, formerly the proprietor of a large brickyard in that city, died on January 4th, aged 76 years. Mr. Gunkle was born in Louisville, Ky., and at the time of his death had been a resident of Indianapolis for 20 years. He was a Mason of high standing, and enjoyed an extended acquaintance.

Frederick Heman, one of the oldest brick manufacturers of St. Louis, Mo., died at his home in that city on January 15th, of la grippe, after a week's illness. Mr. Heman was born in Germany, in 1828, and came with his parents to America at the age of five, first settling on a farm in Franklin County, Mo. In 1842 young Heman obtained employment in a brickyard in St. Louis, and a few years later he became the proprietor of a yard in that city, gradually extending and equipping it until at the time of his retirement from business in 1892 the Heman brick works had become an important industry. Mr. Heman was a member of the Merchants' Exchange, and was well and favorably known in business circles. He is survived by five sons and one daughter.

Fires and Accidents.

The machine building of the Glen Elk (W. Va.) Brick Co. was burned to the ground at midnight, January 2d. The loss is reported at $20,000, with $5,000 insurance. Messrs. Williamson and Thompson, owners of the plant, contemplate rebuilding at once.

Twelve drying houses of the J. H. Rumbaugh Brick Co., of Pitcairn, Pa., were destroyed by fire, January 21st, causing a loss approximating $20,000 with insurance of $15,000. The conflagration is believed to have been set by tramps. It was discovered at 4 a. m. and continued until noon. Twenty-five employes are temporarily thrown out of work.

George Hodge, manager of the Feltwich brickyards at Boonville, Ind., was so badly burned on January 3d, in attempting to rescue his wife and infant child from a burning house, that it is feared the amputation of both arms may prove necessary. Mrs. Hodge was at last reports beyond hope of recovery from the burns she received. The child was unharmed.

The plant of the Atlanta (Ga.) Brick Co., located at Bolton, was totally destroyed by fire on the night of December 27th, entailing a loss of $12,000 with $5,000 insurance. The origin of the fire is unknown. The plant had been in operation for two and a half years, and its average output was 40,000 brick per day. Preparations are under way for rebuilding at once, and contracts have already been placed for a part of the new machinery required. It is expected that the new buildings will be ready for occupancy by March 15th. Eugene H. Thurman is manager of the company.

Seattle Brick for Manila.

The Denny Clay Co., of Seattle, Wash., will furnish 100,000 vitrified brick to be used for paving the streets of Manila, P. I. One block is to be paved as an experiment, and if it prove satisfactory orders will probably be placed with the Seattle firm for a quantity of brick sufficient to pave all the streets in the business district of Manila. In this event the company will enlarge its works at Van Asselt, five miles south of Seattle, in order to fill the contract as promptly as may be.

New Powers in the Trade.

The Glenview Brick Co., of Chicago, has been incorporated with $40,000 capital stock by John R. Harnes, G. F. Lanaghen and S. A. Walther.

The Abilene (Tex.) Brick Co. has been incorporated with a capital stock of $10,000 by A. L. Stephenson, J. L. Stephenson and R. A. Miller.

The Glenview Brick Co., of Chicago, has been incorporated with a capital stock of $40,000, by John R. Harnes, G. F. Lanaghen and S. A. Walther.

The Eubank Pressed Brick Co., of Paris, Tex., has been incorporated with a capital stock of $15,000 by W. R. Eubank, J. R. Ellis and G. F. Hicks.

The Granite Clay Co., of Akron, O., of which C. H. Palmer is president and John Shaffer, secretary, has increased its capital stock from $100,000 to $250,000.

The American Brick & Tile Works, of Oklahoma City, Okla., capitalized at $28,500, has been incorporated by I. N. Phillips, C. A. Campton and W. I. Young.

The Jeffersonville (Ky.) Brick Co. has been incorporated with a capital stock of $8,000 by Charles Akers, sr., Charles Akers, jr., and Robert L. Akers of Jeffersonville.

The Central Clay Product Co., of New York City, has been granted a charter under the laws of Delaware to manufacture clay and kaolin. The company has a capital stock of $130,000.

The Croton Limestone & Brick Co., of New Castle, Pa., has applied for a charter. A. W. Thompson, S. D. Pearson, C. W. Rhodes and J. C. McCready, all of New Castle, are interested.

The Standard Brick & Tile Co. proposing to erect a plant in Richmond borough, S. I., has been incorporated with a capital stock of $500,000. The directors are: Frederick, George and E. A. Jones, of New York City, and H. J. Gallagher, of Brooklyn.

The New Garden Pottery Co., capitalized at $75,000, has been granted a charter and is negotiating for a site for a large pottery plant at Toughkenaman, Pa. S. H. Worth, of Toughkenaman, Percy A. Marvel, of Avondale, and Josiah Marvel, of Wilmington, Del., are interested.

The Ashton Firebrick & Tile Co., of Salt Lake City, Utah, capitalized at $25,000, has been incorporated to manufacture firebrick, tile, sewer pipe, crucibles, etc. The officers are: Edward T. Ashton, president; George M. Cannon, vice-president; and N. L. Morris, secretary and treasurer.

Pacific Coast Letter.

The brick trade of San Francisco and vicinity is rather quiet just at present owing to the general easing up of business on account of stock-taking for the first of the year. The outlook for the brick interests is, however, unusually good, and unless something unforeseen happens the year 1902 should be one of the largest from a business point of view that the trade has experienced for a long time. The country brick trade is somewhat threatened by the long continuance of the dry weather. If the drouth should continue a few weeks longer, there will be a crop failure in many sections of California, and a consequent stagnation of trade in all lines in those districts.

Close estimates of the brick and tile output of Alameda County, Cal., for the year just closed give the following figures: Ten million common brick; 1,200,000 fire and pressed brick; 875,000 ft. of sewer pipe; 630,000 ft. of chimney pipe, conduit pipe, drain tilts and flue linings; 600,000 vases, flower pots, and sundry articles of art pottery. These figures represent approximately the output of the Remillard Co's. Pleasanton yard, N. Clark & Sons' Works, at Alameda Point, the Oakland Art Pottery Works and the California Pottery Works of Oakland. The new pottery established last year on East 12th street Oakland, by Hislop & Phillips for the exclusive manufacture of white and tinted glazed ware, has a new process of glazing which seems to be meeting with success.

Advices from Los Angeles, Cal., state that the Huntington-Hellman street railway syndicate is going into the building material business. According to these reports these people will open extensive brick yards at Inglewood.

The Stockton Brick & Terra Cotta Co., Stockton, Cal., last week made further shipments of sewer pipe to Visalia, Cal. It is expected that this work will be completed in the early part of February.

On December 31st, the city council of Los Angeles, Cal., finally passed an ordinance regulating the establishment and maintenance of brick yards in that city. The brick yard question has been before the city council of Los Angeles for many months and has given rise to columns and columns of newspaper comment. Three applications for permission to establish brick yards have so far been received under the new ordinance. These are: From the Simons Brick Co. to establish a brick yard containing 11.18 acres on Boyle Ave., near the Los Angeles Terminal Ry.; from the Los Angeles Brick Co., to establish a yard containing 10.15 acres, in the Hancock Survey; also for another yard containing 14.55 acres in the Orange Slope tract and from C. G. Berg to establish a brick yard in the Orange Slope tract.

The Salt Lake Pressed Brick Co., whose plant is located on Mill Creek near Salt Lake City, has had a spur track put in connecting the works with the Rio Grande Western Ry.

The plant of the Fire Brick & Tile Co., at Bountiful, Utah, has been sold to some Salt Lake parties, who, it is understood, will incorporate during the early part of this year with a capital stock of $10,000.

On February 1st the newly organized Improved Brick Co., of Salt Lake City, Utah, expects to begin building operations on its plant. The present delay is caused by the non-arrival of electrical machinery. The capacity of the works will be 150,000 bricks per day. The capital stock of the new company is $50,000. The directors are J. F. Woodman, M. C. Fox, F. J. Fabian, F. Junck, and Justus Junck.

The first work of the new administration in the city of San Francisco included the passing of an ordinance adding vitrified brick to the materials to be used in paving the streets of this city. An experiment with this material is to be made at one of the down-town street crossings within a short time.

Fred Joenks, and Mr. Volkam, well known brick men of Oxnard, Cal., have purchased a 50-h. p. boiler and will hereafter use oil in burning bricks.

The new plant of the Arizona Clay Manufacturing Co. at Benson, Arizona, began operations in the latter part of December. The new plant has a capacity of 25,000 bricks per day.

Harbour & Carter, brick men of Los Angeles, Cal., have selected 20 acres just east of the town of Imperial where they intend to establish a large kiln. They are now burning a small kiln at that place for the purpose of testing the quality of the clay. If everything proves satisfactory, a kiln containing 60,000 brick will be prepared and burned.

A movement is under way to establish a brick yard at Whittier, Cal. Heretofore bricks for use in Whittier have been transported from Los Angeles. A number of business men are now figuring on a proposition to open a brick yard on Philadelphia St., Whittier.

V. Holz & Son, brickmen of Grangeville, Idaho, have purchased a tract of seven acres, 1½ miles from Grangeville on which they will during the coming spring, burn a quarter of a million brick. There is a particularly fine body of clay on the tract purchased, and Mr. Holz says that his firm anticipates turning out this season the finest brick they have ever manufactured.

The City Brick Agency, of Portland, Oregon, reports that although no large business buildings were erected in that city last year, and but few of medium size, the number of residences built in all parts of the city and suburbs will bring the aggregate sales of brick for 1901 up to a figure fully 25 per cent above that of 1900.

James R. Miller and John Hotchkiss, of San Francisco, and William A. Doyle, of Seattle, Wash. have formed a company for the purpose of building and equipping a modern brick plant and clay works at Renton, Wash. The new company has an authorized capital stock of $200,000. The buildings for the plant are now under construction and before long the company will begin the manufacture of paving brick, pressed brick, fire clay brick, terra cotta and sewer pipe. It is hoped to get the new plant in operation by March 1st, with a capacity of 55,000 brick per day. The capacity will be increased as occasion demands. Steam driers will be used and the latest improved downdraft kilns will be put in. Seven car loads of machinery and equipments have been shipped from the east. The new plant will work on the shale which the proprietors recently purchased from the Seattle Electric Co. William A. Doyle will act as general manager of the company.

Advices from the City of Mexico state that during the last months of the year 1901, brick making increased immensely in and about Mexico. During this time over 25 licenses for brick yards were granted by the city authorities. A year ago only nine brick yards were in operation. Several new yards have been opened in the vicinity of Mexico.

Dexter & Son, of Wenatchee, Wash., are preparing to put in a new brick-making plant at that place. They will install a lot of new machinery and expect to begin work with a capacity of 15,000 bricks daily.

The Pacific Sand & Lime Brick Co., of San Francisco, Cal., has been incorporated with $50,000 capital stock of which $25,000 has been subscribed. The board of directors includes: C. H. Atkins, John Daniel and M. L. Pancost, of San Francisco.

The Abilene (Tex.) Brick Co., which was recently organized with a capital stock of $10,0000, is preparing to erect a plant in that city for the maanufacture of brick, sewer pipe and other clay products. J. L. Stephenson is interested.

The Cleveland Car Co.

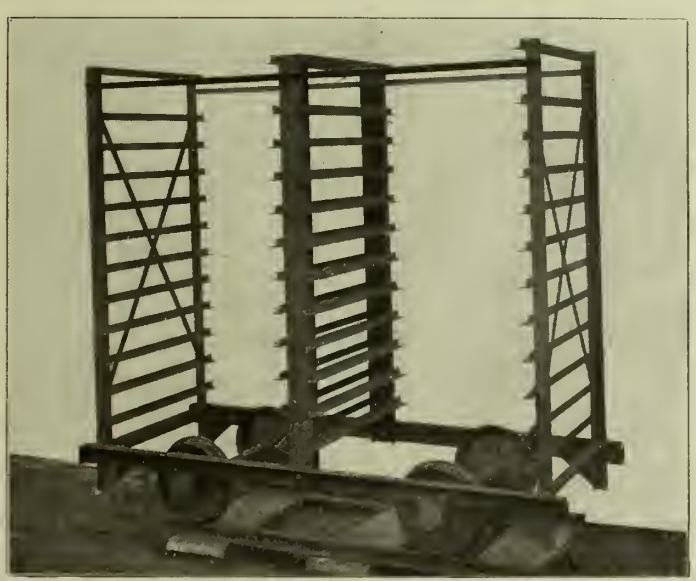
The Cleveland Car Co. was organized about four years ago to engage in the manufacture of drier and clay cars for use in and about brick, tile, cement and sewer pipe plants and in other lines where drier cars are required. A specialty has been made of brick drier cars.

The plant, while not so large as some others, is equipped with modern machinery, and the product can thus be made at a low cost, while more careful attention can be given to small details and more perfect work turned out. With the idea of building cars especially adapted to the needs of brickmakers, the company has been quick to accept the suggestions received from the users of its cars, and thus effected improvements in the design.

W. E. ELLENBERGER.

Among the features of these cars to which the company directs attention is the 12-in. solid web wheel, which has done away with accidents due to the breakage of the light-spoke wheels, and withstands rough usage by careless employes. Another point is the use of steel plate gussets in the rock cars. These gussets are riveted to the angles of the end uprights and project several inches below the side bars, and the plates being bolted firmly to the side bars the uprights are prevented from sagging longitudinally. This construction is apparent from the illustration.

The officers of the company are: F. H. Ellenberger, president; A. C. Caskey, vice-president; W. E. Ellenberger, treasurer, and W. H. Caskey, secretary. The treasurer, W. E. Ellenberger, has also had immediate charge of the manufacturing department, and has proved his efficiency as a capable business manager. In this capacity he has been ably assisted by W. H. Caskey in carrying on the business. Both gentlemen are young and progressive, and have devoted their energies to the building up of a prosperous and lucrative business. It can be said of this company that there has been no occasion for shutting down at any time since its organization, except for repairs and inventory purposes, and it has often been necessary to hire a large amount of additional help and to put in considerable overtime to handle the business satisfactorily. Their outlook for the ensuing year is most satisfactory. The capacity of the plant, it is expected, will be increased soon by the addition of new machinery, and thus purchasers will be assured of the most prompt attention.



THE "CLEVELAND" CAR.

A cordial invitation is extended to all members of the National Brick Manufacturers' Association attending the coming convention to call at the works of this company, where they will be accorded the most courteous treatment.

G. L. Reidesel and H. Babcock are mounting a new brick works at Denver, Col. The plant will have an output of 20,000 brick per day.

A. J. Harnack and T. L. Gartner, of Pittsburg, Pa., have opened negotiations for the purchase of a number of brick plants in Columbiana County, O.

C. E. Corporan is promoting a new brick plant at South Colorado City, Colo. A company is being organized and a large amount of capital stock has been subscribed.

Dan Diver, of Deerfield, Mich., is organizing a company to develop the deposits of clay at Great Slave Lake. A modern brick plant with a large capacity is contemplated.

Cruger & Pace, brickmakers of Albany, Ga., whose works have a present annual capacity of 10,000,000 brick, have decided to install new machinery and increase the output.

The Harper-Norton Shale Brick Co., of Conneaut, O., has awarded the Crown Dryer Co., of Cleveland, the contract for replacing its dry kilns with hot air apparatus.

The Citizens' Coal Mining Co., of Lincoln, Ill., will add the manufacture of brick to its other industries, beginning operations in March. Sixty additional men will be employed.

The Powhattan Clay Manufacturing Co. has opened a new and modern plant at Clayville, Va., and is introducing an unusually fine product. A force of 75 men is employed regularly.

C. F. Bush, of Mexico, Mo., has discovered deposits of valuable fireclay underlying his farm, and contemplates erecting a brickyard. Samples of the clay are on exhibition at the principal stores of Mexico.

The Soisson Brick Co., of Connellsville, Pa., has acquired the plant of the Kingston Silica Brick Co., formerly owned by O'Brien & Son. The Soisson company will increase the capacity of the plant and continue its operation.

The Stockton (Cal.) Brick & Pottery Co. has completed its contract for installing a sewer system in Visalia, and is about to begin the construction of new sewers in the city of Stockton. The contracts amounted to $35,000 and $60,000 respectively.

The Canon City (Col.) Brick & Tile Co. reports an average output for the past year of 20,000 brick per working day. At the company's annual meeting January 12th, Charles Pauls was elected president, and W. H. Trout, secretary, treasurer and general manager.

Echoes FROM THE Trade

The Means Foundry & Machine Co., Steubenville, O., has just completed a three-room brick office with hardwood finish. It is an exceedingly substantial structure which will enable the company to handle the office work of its constantly increasing business to much better advantage than hitherto.

The Ironsides Co., of Columbus, O., which manufactures special lubricants for wire ropes, gearing, belting, fibre ropes and metallic surfaces generally, reports recent extensions in its equipment which doubles the former capacity. The company reports that business is in a flourishing condition.

The Cling-Surface Manufacturing Company is in receipt of the two following letters from Pennsylvania: "We are using Cling-Surface in our belts with good results and will order again. Manown Mfg. Co." "'Cling-Surface' is O. K.; it is all you claim it to be. Penn Brick Co., Ltd."

The Burt Manufacturing Co., of Akron, O., has received a sixth order from the Calumet & Hecla Mining Co., for "Cross" oil filters, making twelve of these filters now in use in their different mines. In addition to the extended sale of its goods, which embraces the entire world, the Burt company finds much satisfaction in the large number of "repeat" orders which it receives from the larger concerns.

The American Clayworking Machinery Co., Bucyrus, O., is issuing to the public a small pamphlet entitled "In Advance." A violet horseman on a white horse is on the front cover and appears on the inside in brown carrying a huge banner advertising the excellence of the American clayworking machinery. All the leading classes of machine and brick yard equipments are illustrated within and the pamphlet is a handy pocket size for reference by the prospective buyer.

H. Brewer & Co., of Tecumseh, Mich., manufacturers of clayworking machinery, announce the appointment of Omer Smith, of North English, Ia., to represent them in that state and contiguous territory. Mr. Smith is a member of the firm of E. J. Smith & Sons, of North English, and is interested in the American Brick & Tile Co., of Mason City, and the Ottumwa Brick & Construction Co. His long experience in brickmaking and his wide acquaintance with the trade make his services particularly valuable to the firm he represents.

The M. Mitshkun Co., Detroit, Mich., is issuing its 1902 catalogue illustrating its large and varied lines of locomotives, cars, steam shovels, rails and all kinds of railway equipments and tools. A large business is done with logging and construction companies and switches, frogs, switch stands and connections for side track turnouts. Locomotives of every size and type are supplied at both standard and odd gages. The Mitshkun company makes a special feature of steam shovels for excavation and quarrying purposes, the Hayward class "A" patent "Clam Shell" bucket is of very strong construction and capable of performing heavy and reliable work. Another specialty is the Buckeye heater which is used for straightening damaged steel cars. Other lines are cars of every class, ball-bearing jacks, all kinds of track tools, hoisting engines, derricks and cranes. The catalogue concludes with a page of valuable tabular matter.

Our German contemporary the Thonindustrie-Zeitung of Berlin, has just mailed to us a copy of a new calendar for the year 1902. Ample room is left between the days for the noting of special appointments and there are quite a number of blank leaves at the end for special matter. There is a small additional volume mailed with it which contains a whole host of information suitable for the clay-worker, illustrating a number of brick yard suplies and giving their cost and source. It concludes with a practical supply directory which is sure to be of great value to the German clayworker.

The American Blower Co., of Detroit, Mich., reports its factory operating to its utmost capacity, filling orders for apparatus in the company's various lines of manufacture. It has recently booked orders for brick drying apparatus from the following: W. D. Richardson, Cleveland, O.; the Lackawanna Iron & Steel Co., Vintondale, Pa.; the National Fire-Proofing Co., Canton, O.; the Harbison & Walker Co., Pittsburg, Pa.; the Boyd Hill Brick Co., Pittsburg, Pa., and the Don Valley Brick Co., of Toronto, Ont. Every brick manufacturer interested in economical drying is requested to investigate the "A B C" waste heat dryer.

The Bonnot Co., Canton, O., reports unusually good business in its line. It has recently supplied the entire equipment for the new brick plant erected by the Bessemer Lime Stone Co., of Youngstown, O. This outfit includes one "Admiral Dewey" special combined brick machine, automatic cutting tables, two 9-ft. dry pans, a 12-ft. pugmill, elevators, cars, etc. Other recent sales of brick machinery are a No. 1 brick machine, a 9-ft. dry pan to the Canton Hollow Block Co., of Canton, O., and two 9-ft. dry pans to the Texas Portland Cement & Lime Co., Dallas, Tex., also a double die repress to the Terre Haute Brick & Pipe Co., Terre Haute, Ind.

The Joseph Dixon Crucible Co., Jersey City, N. J., mails its usual monthly pamphlet "Graphite". It contains a variety of interesting matter, is full of fun and never omits to present in the most pleasing manner, the superlative advantages of the Dixon products. Amongst other good things it quotes Puddenhead Wilson's remarks on "Circumstantial Evidence", which will bear repeating: "Even the cleverest and most perfect circumstantial evidence is likely to be at fault, and therefore should be received with great caution. Take the case of any pencil sharpened by any woman. If you have witnesses you will find that she did it with a knife, but if you take simply the aspect of the pencil, you will say she did it with her teeth."

The Winkle Terra Cotta Co., Century Bldg., St. Louis, Mo., which is a well-known manufacturer of architectural terra cotta, has recently issued its calendar for 1902, which is extremely attractive. The card is covered with a symbolical design photographed from a wax model by Schweitzer, a youthful figure holding in its hand a globe, emblematical of a world-wide trust in the excellence of the company's products, a Hercules, club in hand, emblematizes their strength and a Roman centurion with shield extended is the symbol of perfect security. The calendar can be obtained by application to the company's offices.

We have just received from the Henry Martin Brick Machine Co., Lancaster, Pa., what appeared to be a bunch of bills and checks of varying values, but on opening we discover that the inside of the circular is devoted to the illustration of the many kinds of machinery placed in the market by this company. Special reference is called to the abundant facilities for the thorough

equipment of brick plants, and a recommendation is given the reader to send for a copy of the general catalog, which will give careful descriptions of the machinery illustrated.

William Wirt Clarke & Son, Baltimore, Md., are pushing their special vitrified street paving blocks. In a recent contract for the year 1902 their blocks were accepted on account of their excellent quality notwithstanding the fact that theirs was the highest bid among the other blocks offered. Contracts were also secured for the supply of all the vitrified sewer pipe required by the city for 1902. The "Clarke" pipes having passed successfully the very severe grinding tests by the City Engineering Department. This firm will also supply material to the department of public parks and the electrical subway commission of Baltimore, and also the war department at Washington, the navy department at League Island, Brooklyn, Norfolk, Va., Mare Island, Cal., and also at Cavite, P. I.

The Davis-Price Foundry & Machine Co., New Cumberland, W. Va., is sending through the mails a small leaflet with the startling title of "Looking for Trouble?" Upon opening this, however, we are informed that "When in trouble come to us." The several troubles which the company undertakes to remedy are those in connection with break-downs. Extra stocks and all parts for Means, Penfield, Carlin and Stevenson pans, Raymond No. 777, and Freese & Penfield brick machines, Means, Penfield and Raymond pugmills are carried, so that if breaks occur these parts may be quickly supplied at a small cost. Special quotations are also made on wheelbarrows for clay or bricks, trucks and gigs, coal or clay cars while die orders are given special attention. The reading matter is enlivened by a photograph of Cupid with his bow broken. If such an event ever happens, there is bound to be trouble indeed.

The company has just held its annual meeting and find that the results of the first year's business shows a net profit of 8 per cent of the capitalization. It has offered to its employes 5 per cent of the net profits for 1902 in addition to their wages, thus making them profit sharers in the business. This method of insuring intelligent co-operation and efficient work from the employes is highly commendable, and wherever this has been done hitherto it has been a great step towards the avoidance of labor troubles and the unsatisfactory quality of labor. A good class of labor is obtained and unsatisfactory men are soon weeded out by the employes themselves, and every workman constitutes himself an intelligent force for the achievement of the common end—a successful business.

Industrial Railways.

Electric railways have long been recognized as an important time and labor saving device in and about manufacturing plants, for use in mines and by contractors, and naturally the makers of railroad materials have given a good deal of attention to this field. Among those who have realized very good results in equipping roads of this type, as well as running them economically, is the well-known firm of Arthur Koppel, of New York. This firm has built many electric roads for industrial purposes and has also developed portable electric railways, thus making electric railroads available for such as have to use them at different places, and at each place for a comparatively short time. All the parts composing these equipments are light and easily handled, and the roads can be rapidly laid down. Every detail is thoroughly worked out and even especially constructed and patented cars for stringing the trolley wire enter into the equipment.

Electric railways have been built by Arthur Koppel in many different countries, and for many different purposes, as for instance factory roads bringing the raw material into the plant, carrying the different materials around, and finally taking the finished product to the station, for mines, for contractors, for plantations, and even for passenger traffic.

In order to give interested parties an opportunity to get acquainted with these industrial roads, their working and their equipment, the firm has erected in its New York office at 66 Broad St. an exact model of such an electric railroad in 1-10 actual size, equipped on the overhead system, with electric locomotive and coal, flat, plantation, contractors' and passenger cars. The firm also publishes a special catalog on this subject.

Bechtel's Rapid Hacking and Trucking System.

One of the particular objects which the brickmaker has ever in view, no matter what may be his daily capacity and the extent of his annual output, is the effecting of a saving in handling the brick. Among those that are laying themselves out to cater to this demand is Byron E. Bechtel, of Waterloo, Ont., who presents to the public a system of making, drying and handling brick which he claims to be a great improvement on all previous methods. The system comprises from two to four trucks and a hacking system designed to take the place of several hundred common brick cars, and it is stated that from 25,000 to 40,000 bricks per day can be moved by one man with one truck, from the machine to the hacks, or from the hacks to the kiln after the bricks are dry. The trucks for each purpose differ slightly in construction according to the demands of the case. The particular points which should commend the system to the clayworkers are: The brick are not handled individually, for they are put upon the pallet by the machine hands and not touched again until they reach the hands of the tossers in the kiln; they are therefore unmarked and as perfect as when they came out of the machine. Second, the system endeavors to obviate the cost of artificial driers. Third, the trucks can be operated by unskilled labor. Fourth, work may be carried on uninterruptedly in all kinds of weather. Fifth, only two or four trucks will need repair and care. A catalog showing the methods employed may be obtained by writing to Mr. Bechtel.

The W. S. Dickey Clay Manufacturing Co., of Kansas City, Mo., will build a $200,000 plant in southeastern Kansas within the coming year. The exact location has not yet been determined upon.

The C. W. Raymond Co. offers a display of modern brick machinery in operation, and invites all delegates and others attending the convention at Cleveland to stop over at Dayton on their way to or from the convention and spend a day in the "Gem City" of Ohio.

TO FLORIDA.

The Monon Route night express has a through sleeper for Florida every night, leaving Chicago 9 p. m., traversing the beautiful mountain country by daylight and arriving at St. Augustine at a convenient hour in the morning. City ticket office, 232 Clark St., Chicago.

FOR SALE AT A BARGAIN—The following brick machinery, which is practically new, having been used only a few months;
One "Hercules" extra heavy Soft Mud Brick Machine.
One Horton Mfg. Co. Mold Sander.
One 5-leaf Dumping Table.
One Double Transfer Car.
One Combination Transfer Car and Turntable.
One Raymond Victor Repress.
Address
THE CLINTON COUNTY FIRE BRICK CO.,
Mill Hall, Pa.

FOR SALE—All or three-quarters interest in a Brick plant, capacity six millions a season, five millions made last summer and all sold, good market, inexhaustible Bank of finest Clay, with 125 H Corliss Engine, 2 Boilers 125 Horse, Brick machines, and all necessary Buildings, and Tools of all kinds, Racks, Pallets, also Steam Dry House with separate Engine Boiler, Pumps, etc., Saw Mill in connection to run in winter when too cold for Clayworking. A complete business. Principal owner retiring whose interest may be purchased and owner of remaining quarter interest being thoroughly conversant with the business will oversee and educate purchaser to manage if not acquainted with the business. This is an exceptional opportunity for a bright young man to become established in a sound legitimate business in a most healthy, invigorating and delightful climate. For further detail, address
"OPPORTUNITY", care of "Brick."

BRICK

A Monthly Magazine, devoted to Brick, Tile, Terra Cotta and Allied Clay Industries.

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We want our readers to feel always that BRICK is their paper, and that what interests them interests its publishers and subscribers. We will therefore appreciate most highly any communications, questions, experiences or suggestions, or marked copies of local papers containing items of news pertaining to the interests of clayworking.

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The Conventions.

All but one of the clayworkers' associations have now held their annual meetings, and we may now try and draw a few lessons from these various conventions. The convention habit is one that grows upon one, because the regular attendant has the liveliest appreciation of the good work done by these associations and the value of their annual meetings to the clayworking industry. Let us consider the January and February conventions.

* * *

The Illinois State Association met in Galesburg and was an unqualified social success. We cannot remark that there was any increased interest shown in the discussions, but the papers presented were up to the standard and the whole resulted in a good convention.

* * *

The Iowa State Association held an exceptionally good meeting at Des Moines, and we believe that one important reason for this was the support which the association receives from the Iowa State college. The college is greatly interested in the Iowa brick industry, and the scientific investigations and reports, for which we are indebted to that institution and its faculty, have been of marked benefit. There is a great deal to be learned from the state geologists and the colleges, and their co-operation has done much to improve the quality of the technical papers for conventions. The work of the Iowa State college was appropriately recognized by choosing Ames as the place for holding the 1903 meeting of the association.

* * *

In Wisconsin also the state association had a convention which was in every way a distinct advance over that held last year. The enthusiasm of the members was greater, if possible, than at the organization a year ago; the papers were excellent and brought out extended discussion. The brick manufacturers of Milwaukee were the hosts, and showed every possible courtesy to visitors.

Next comes the convention of the N. B. M. A. at Cleveland. At this one thing that impressed us, as we presume it did others in attendance, was the excellent manner in which the committees in charge handled the local arrangements and all matters pertaining to the entertainment of visitors. The committees were composed of local men, who were well acquainted with the resources of the city and knew what could be used to great advantage. The result was a vast improvement in the management, as compared with other recent conventions of this association. It is a pleasure to testify to the admirable manner in which both the Cleveland and Milwaukee committees planned and carried out their convention arrangements.

* * *

In the matter of registering, the example set at Cleveland should be followed at future meetings. On registering each delegate received a numbered badge, and every day a bulletin, giving the names and addresses, with the corresponding numbers, was issued, enabling delegates to not only readily recognize other clayworkers, but to identify them by name as well. In other minor matters the same care was observed theater tickets were distributed in good season and without mistakes, the special train for the excursions to the brick plants was on time, and all those little annoyances often encountered at such meetings were noticeably absent.

A fact which militated against the delegates becoming better acquainted was that the headquarters hotel was conducted on the European system, and that many, perhaps the majority of those in attendance went elsewhere for their meals.

* * *

Conventions are a great thing. At such times and places men meet to exchange ideas and experiences, and barriers of distrust are swept away by the good-fellowship it engenders. Of course, one does meet some misanthropists, who inveigh against conventions and declare with rancorous note that "he never saw any use in conventions, as he never did any business there." This is the worst possible light in which one can view the objects of a convention. The convention lays a foundation for future commercial and social intercourse for the whole year through, and even from a financial standpoint its value to the individual cannot be over-estimated. There is an influence upon trade relationships, prices, etc., that is not at once apparent, but which will surely be felt in the long run.

* * *

Regarding the work of the N. B. M. A. convention, the papers were better than has usually been the case, and the discussions were far inferior in value to those at previous conventions. This criticism of the discussions does not apply to the remarks of those having the opening, but to the general impromptu discussion; on the contrary, the remarks of those who had been assigned to open discussions on various subjects had been carefully prepared and were listened to with interest. In too many cases the opening was followed by a series of statements such as these "I have found this a good thing," by one speaker, and "My experience is just the reverse," by the next. Such discussion is valueless; what we want to know is, why the first man got good results, and just what the conditions were that caused the second man to fail.

We attribute the better quality of the papers to the fact that every year brickmaking is becoming more and more of a science. Proprietors are learning more about their raw materials, are taking expert advice about the proper treatment, and are living up to the present age of expansion in seeking wider markets.

* * *

We had expected that there would be a discussion at the convention on the subject of the rattler test for paving brick, and the failure to consider this subject is a disappointment which we feel will be shared by all interested in seeing a standard test

agreed upon that meets with the acceptance of city engineers and others who have to pass on paving brick.

The most important of the committee reports was that on "Specifications for the Construction of Brick Pavements."

* * *

The convention passed resolutions paying a graceful tribute to President Hunt and to those who had been in charge of the local arrangements, and also authorized the appointment of a committee to confer with Dr. David T. Day as to the best means of securing a clayworking exhibit at the St. Louis Fair that shall properly represent the industry.

Months ago "Brick" laid before the Fair authorities a complete scheme, which would insure the proper representation of all the various branches of the clayworking industry, and in our January issue we explained a number of the leading features of this plan, which had the hearty indorsement of Dr. Day and of many prominent clay manufacturers, and it gives us great pleasure to have the co-operation of the N. B. M. A. in this matter.

* * *

Already we hear rumors of other state organizations in the air. The Northwestern Association will hold its first convention early in March, and we expect great things from it in the course of a year or so. Prof. E. R. Buckley, who founded and was the first secretary of the Wisconsin organization, has in prospect a Missouri association, which he hopes will eclipse in strength and progress any other state association, and as the tide of commercial triumph rolls westward we may expect to see other states organize other clayworking forces and contribute their experiences in material and literary form for the benefit of their clayworking brethren at large.

* * *

The Ohio Brick and Tile Association is not holding a meeting this year, and we believe that it was wise in not doing so, owing to its probable conflict with the N. B. M. A. There is, however, a grand opportunity for a first-class meeting to be held by this association in 1903, and it should reap a harvest of much life force as a result of the excellent convention held in the state by the N. B. M. A. this year.

Pottery News.

A new pottery company has been organized at New Brighton. Pa., under the name of The Keystone Pottery Co. Mr. H. C. Rigby, formerly superintendent of The Keswick China Co., at Beaver, Pa., is at the head of the institution. Only two kilns will be operated at once.

Ernest Mayer, of The Mayer Potter Co., at Beaver Falls, Pa., has been elected president of the American Ceramic Society at its recent convention at Cleveland, O. F. W. Walker, of The Beaver Falls Art Tile Co., was elected first vice-president.

The following officers were elected at the annual meeting of the Akron China Co. President, Jos. Cooke; secretary, Jas. N. Cooke; treasurer, J. G. Ingalls. The following board of directors were elected to serve for the ensuing year John Cooke, Wm. Zook, Chas. Shindel, T. N. Cooke, Jos. Cooke, J. G. Ingalls and C. W. Wickline. This concern was organized in 1894 during the pottery strike of that year, mostly by operative potters and has been very successful ever since. It is said that the company expects to enlarge its plant this coming spring.

The Union Potteries Co., of Pittsburg, Pa., have concluded to run their plants entirely in the future on the manufacture of only certain pieces of dinnerware. Their plants have been changed and altered so as to make these goods rapidly and at a minimum cost. Many large orders have been entered for this class of goods alone and the outlook for the future is very good.

The Star Pottery Co., of Trenton, N. J., are making extensive additions and repairs.

At the annual meeting of the Indiana Ceramic Society the following officers were elected Mrs. J. N. Orndorf, president; P. K. Hale, secretary, and Mrs. Edward Mayer, treasurer.

A new pottery company has been organized at Warren, O., with the following stockholders E. M. Fisher, R. E. Larkins, E. W. Bradshaw and Thos. Burton. The name for the new company has not, as yet, been selected, but the stockholders are for the most part potters from Trenton, N. J.

The following officers and directors have been elected at The Mosaic Tile Co., at Zanesville, O.: President, David Lee; vice-president, W. N. Bateman; secretary, W. M. Shinnick. The following directors were also appointed: David Lee, M. W. Bateman, Ed. Moesure, W. M. Shinnick, W. E. Miller, A. W. Evans and J. W. Sutor.

The Crown Pottery Co., at Evansville, Ind., has been sold by its present stockholders to A. M. Weil, of Evansville, who also has charge of the Peoria pottery at Peoria, Ill. Mr. Weil will take charge of the plant at once.

The plant of The Greenford Tile Co., at Greenford, O., was entirely destroyed by fire last Sunday evening, entailing a loss of about $5,000. The fire is thought to be of incendiary origin.

It is said that East Palestine (O.) is to have another pottery. Stockholders of The East Palestine Pottery Co. and other residents of that city are interested and it is thought that the deal will be a "go."

It is reported that The Bell Pottery Co., of Findlay, O., will in the near future, build a pottery at Columbus, Ohio. It is known that the company increased their capital stock some months ago and it is also known that a deal is one between Mrs. Frey, of Columbus, O., whereby the Bells will become the owners of about 169 acres of land in the vicinity of Columbus, O. The price to be paid is said to be in the neighborhood of $400 per acre.

The Thomas China Co., of Lisbon, O., have just finished their line on samples and drew their first kiln of decorated ware for the market last week, which came out with very gratifying results. Matters are being pushed in every department and samples have already been sent out to the dealers. The concern are making a specialty of underglaze work and the results obtained in this department are especially gratifying. It expects to have a full dinner and toilet service on the market within the next two week at least.

The New Castle Pottery Co., at New Castle, Pa., are installing a new steam plant. The additions will be completed within the next few weeks.

The entire plant of the Locke Insulator Co., manufacturers of insulators and electrical porcelain, was destroyed by fire, entailing a loss of between $40,000 and $50,000. It is said that the plant will be rebuilt at once.

The Crooksville Art Pottery Co., of Crooksville, O., has been incorporated with a capital stock of $60,000. The company are as yet undecided as to the lines they will make, also as to whether the output will be confined to white ware or art ware. The officers of the new concern are as follows J. L. Bennett, president; J. M. French, vice-president; G. E. Crooks, secretary and treasurer; S. H. Brown, manager. The following directors have also been appointed O. F. McKinney, P. W. Newton, S. H. Brown, W. H. Brown, J. L. Bennett, J. M. French, E. L. Taylor. The concern will erect their plant this spring and expect to be in operation by midsummer.

The Weir Pottery Co., at Monmouth, Ill., has increased its capital stock from $25,000 to $80,000.

The Universal Sanitary Manufacturing Co., at New Castle, Pa., is making some additions in the way of new engines and boilers, and also some new clay-working machinery. The Patterson Foundry Co., of East Liverpool, O., is putting in the new machines.

The February Conventions.

American Ceramic Society.

The American Ceramic Society held its fourth annual convention at Cleveland, O., Feb. 10-12, 1902. The sessions commenced promptly and were well attended. Every member of the society was alive for enquiry and response, and the excellence of the papers will be a revelation when they are issued in the usual course of time in printed form. Nowhere in the world has there been gathered together a body of men whose small number is so disproportionate to the amount of information it collects and the incalculable benefits to the clayworking industries it confers. To hide, to conceal, to veil, to mislead—these obstructionary infinitives were the vertebrae of the potter's policy towards his neighbor in times past, while giving, confiding, exchanging and showing where participles whose material and practical expression would be and were only to be labeled, "Suicidal." We are but now emerging from the middle ages of commercial narrowness and to our mind the American Ceramic Society is pursuing the right policy with a power and truth of direction which commands admiration and respect. The members never seemed to be weary, commencing early and hanging on to the subject of discussion till the latest hour, regardless of gastronomical considerations. And still later, up to midnight, could be seen in the hotel lobby small groups, who talked fluxes and silicates as a lover talks with his mistress, and at the last session there was not a particle of enthusiasm and energy lacking to sustain the point and interest of discussion.

The officers for 1902 were elected as follows: Ernest Mayer, of Beaver Falls, Pa., president; Francis W. Walker, of Beaver Falls, Pa., vice-president; Edward Orton, jr., secretary, and Stanley G. Burt, treasurer.

After the address of the retiring president, Charles F. Binns, of Alfred, N. Y., and the routine business, the program was as follows

February 10th, 2 p. m.

"Note on the Grinding of Materials used in Earthen-Ware Bodies." By Ernest Mayer, Mayer Pottery Co., Beaver Falls, Pa.

"Chemical Changes Occuring in the Vitrification of Crude Clays." By Edward Orton, Jr., Ohio State University, Columbus, O.

"Topics Proposed for Discussion. Why do vitreous bodies shrink more from use of feldspar as a flux than from Cornish-stone, all other things being equal? (Prudy)

February 11th, 9 a. m.

"English Legislation on Leadless Glazes." By Milton Parker Rix, Newcastle, England.

"Stoneware Glazes." By Ross C. Purdy, Macomb, Ill.

"Engobes and Stoneware Slips." By Samuel Geijsbeek, Golden, Colo.

"Composition of Porcelains for Electrical Purposes." By Arthur S. Watts, Zanesville, O.

February 11th, 2 p. m.

"Opportunities for Research in the Factory." By Charles F. Binns, Alfred University, Alfred, N. Y.

"Oxide of Tin in Ceramic Fluxes." By Stanley G. Burt, Rookwood Pottery Co., Cincinnati, O.

"Notes on the Development of Greens From Cupric Oxide in Glazes." By Francis W. Walker, Beaver Falls Art Tile Co., Beaver Falls. Pa.

Topics proposed for Discussion. Is any kiln in use in which either hard or soft coal can be economically used without changing grates? (Gray)

February 12th, 9 a. m.

"Note on the Relative Point of Dehydration of Pure and Calcareous Clays." By William M. Kennedy, Beaver Falls, Pa.

"Bacterial Growth as a Factor in the Agency of Clay Bodies." By Edward C. Stover, Trenton Potteries Co., Trenton, N. J.

"The Sand Brick Industry." By Samuel V. Peppel, B. Sc. Columbus, O.

"The Equipment of a Modern Paving Brick Plant." By Willard D. Richardson, Cleveland, O.

Other papers were given, not on the program, the most noteworthy being one by Dr. Zimmer of Germany on the substitution of galena for lead in glazes.

Some of the papers were amazing in grasp of their subject and specially so were those by Francis W. Walker, Samuel V. Peppel, Willard D. Richardson, and Arthur S. Watts, who illustrated the subjects handled by diagrams and specimens of surpassing interest.

The convention adjourned at 1 p. m. to meet again in summer session, probably at East Liverpool, O., though the place has not been definitely determined.

N. B. M. A.

The 16th annual convention for the National Brick Manufacturer's Association was held at Cleveland, O., Feb. 12 to 15, 1902. The headquarters of the association were at the Hollenden Hotel, where all the sessions of the convention were held. The city of Cleveland is noted for the many conventions held within its limits. Its geographical location renders it especially adapted for such purposes and as regards the clay working industry it is eminently so, inasmuch as the city of Cleveland itself has numerous brick yard industries contributing to its life and activity. Several of these were visited by the members of the convention and it was then to be noticed that every kind of brick was included in the products, such as common building brick, sewer brick, pacing brick, press brick, fire brick, blocks, etc., while within a very short radius there are numerous sewer pipe, tile and pottery plants easily accessible on the various railroads which enter and leave the city. Since the organization of the N. B. M. A. the growth of the association has been a steady one; it has seen its hard times through business depressions and commercial changes, and indeed at its birth the business prospects were none of the brightest. Nevertheless year by year the same faces came to the meetings with here and there a new one and year by year the objects and aims of the association became better known throughout the country. It is to be recorded now, however, with much gratification, that Cleveland has been able to establish a new high water mark in the tide of the association's progress. The membership of the society now exceeds 400. There was nearly this many registrations at the Cleveland convention, and the fine showing of Treasurer Sibley of a balance in the treasury for 1901 of $817.63, speaks sufficiently well for the financial prosperity of the association.

The first meeting commenced promptly at 2:30 on the afternoon of February 12th, and at the session the president, William H. Hunt, delivered his annual address, which is published on another page.

At 8 o'clock in the evening over 400 guests sat down in the large dining room of the Hollenden to a very fine menu, and after all the good things had disappeared the usual order of after-dinner speeches followed. The toastmaster was President Hunt. Many interesting speeches were given.

On Thursday morning there was no session at the convention but the delegates and visitors trooped down to the Baltimore &

Ohio and Valley Railroad station, and embarked on a special train which carried them from brick plant to brick plant offering an opportunity of seeing several different processes of manufacture. The first stop was made at the plant of the Cleveland Hydraulic Pressed Brick Co., at South Park, 10 miles from Cleveland. The famous Akron impervious and ornamental pressed brick, the staple products of this company, have a great name throughout the country, and the visitors were able to touch, see and handle the products of which they had heard so much. Everything about the plant was in perfect order and the appliances were of the most efficient type. Long rows of tables creaked under a sumptuous supply of solid and liquid refreshments, to which the visitors were not slow to help themselves.

From there the train proceeded to the works of the Standard Brick Co., where common building brick was made by the soft clay process, and after a brief stay the plant of Mr. F. H. Eggers was visited, where shale building and sewer bricks are made and burned in round down draft kilns. At this plant the visitors were much interested in the driers which are equipped with fans made by the New York Blower Co., of Bucyrus, O. The hotel was reached about 1:30 and at 2:30 the afternoon session was commenced. On Thursday evening the members and their wives attended the theater.

Northwestern Brick Manufacturers' Association.

The convention of the Northwestern Brick Manufacturers' Association will be held at Princeton, Minn., on March 4, 1902, and it promises to be the largest attended meeting of any yet held. There is ample opportunity for the rapid growth of this association, inasmuch as it will draw for its membership from all contiguous states which are now beginning to develop to a large extent other clay industries. There are now numerous plants springing into existence and there is no reason why the Northwestern Brick Manufacturers' Association may not hold a high place in the associations already organized in this country. W. P. Alsip, the president of the association, is a man who is genial, kind and a hearty worker on the association's behalf. He has devoted considerable time to the interests of the organization and we trust that his efforts will be rewarded with a most successful convention. We append the interesting program of the sessions:

President's Address, W. P. Alsip, Grand Forks, N. D.

Report of Secretary and Treasurer, Louis Moline, Willmar, Minn.

Address of Welcome, Princeton Brick Manufacturers.

"Transporting Clay from Bank to Machine," Mr. Vance, Crookston Brick Co., Crookston, Minn.

"Stiff Clay Brick," W. H. Oakes, Princeton, Minn.

"Soft Clay Brick," John Dinnie, Grand Forks, N. D.

"Dry Press Brick," Twin City Press Brick Co., St. Paul, Minn.

"Burning Brick in a Continuous Kiln," Gustave Haut, Perham, Minn.

"Driers—Drying Brick from Cooling Kiln with Fan," W. S. Russell, Grand Forks, N. D.

"Out-Door Drying," O. Douclos, Little Falls, Minn.

"Grading Brick," Henry Ames, Litchfield, Minn.

"Question Box"—Bring your troubles with you. Hand them to the Secretary in writing.

Election and Installation of Officers.

Appointment of Committees.

The Champlain (N. Y.) Brick Co. has elected the following officers: C. W. Keefer, president; N. C. Squires, vice-president and secretary; C. E. Hopkins, treasurer, and William Duffney, general manager.

Two French Works on Ceramics.

"Technologie de la Ceramique" and "Les Industries Ceramiques" are the titles of two very valuable contributions to clayworking literature recently published by J. B. Bailliere & Fils, 10 Rue Hautefeuille, Paris. The authors of both works are E. S. Auscher, engineer of arts and manufactures, and Charles Quillard, engineer and chemist.

"Technologie de la Ceramique" opens with a consideration of the various clays, felspars, kaolins, quartz and sands, and after a brief discussion of several glaze formulas, the work takes up careful descriptions of the various methods of preparation of clays by washing, slumming, crushing, screening, pugging, etc. Illustrations are given of the many methods employed, and then follows an interesting treatment of the machinery, such as jollies, throwing wheels, etc., used for the manufacture of the different pottery products. Special directions are given as regards drying and burning, and several interesting tables are presented as to the values of the various fuels. Several chapters are devoted to descriptions of kiln types and the methods of measuring high temperatures. The work concludes with methods of decoration, and the products and the machinery used to obtain the best results.

"Les Industries Ceramique" is practically a sequel to the foregoing, and deals with the history of the art from the earliest times and the discovery of porcelain in France and Europe, a description of the industries in the sixteenth century, and then takes up the treatment of the clay products—bricks, tiles, majolica, sewer pipe and fine pottery. Many valuable recipes are presented and explicit instructions as to the methods of manufacture calculated to produce the highest results. Considerable space is devoted to glazing, and the whole work reveals the fact that a clayworker to reach the highest pedestal in his art, must be at once a mechanist, physicist, chemist and artist; a mechanist to mix correctly his clays and glazes; a physicist to understand the proper regulation of the burning; a chemist for the correct understanding of the admixture of pastes and colors, and an artist to achieve the highest decorative effects.

The two works are well worth perusal, and combined they contain some 700 pages and 150 illustrations. The price for both is 10 francs.

The Kirkham Art Tile and Pottery Co. has been incorporated at Pasadena, Cal., with a capital stock of $100,000. The company will manufacture art tile and art pottery.

The Findlay (O.) Clay Pot Co. has decided to double the capacity of its plant at Washington, Pa. When the improvements are completed the Washington plant will represent a total investment of $200,000. The general office of the company will remain at Findlay.

The company operating the Barnes Brick Works, Fairmont, W. Va., has been reorganized as the Hutchinson Brick Co., a large interest in the business having been purchased by Hutchinson Brothers, of Fairmont. The new owners will remodel the plant, and expect to have a daily output of 45,000 brick.

Wm. McCubbin, of Braymer, Mo., is prospecting for oil and gas in his section of the state. Two drills are at work and the third one will be started in a few days. The prospecting is being carried on by two companies with a capitalization of $500,000. The prospects are splendid for an oil strike as oil is exuding from the ground in many places. Mr. McCubbin is a well-known manufacturer of hollow building blocks, vitrified paving brick, pressed building brick and drain tile.

OHIO VALLEY LETTER

FROM OUR SPECIAL CORRESPONDENT

At a stockholders' meeting of the National Fire-proofing Company held in Pittsburg, a resolution was unanimously adopted to increase the capital stock from $5,000,000 to $12,500,000. This was to provide funds with which to buy out some 15 other concerns engaged in a similar line of business, and at the same time furnish a working capital of $1,000,000. The plants it is proposed to purchase are located in different sections of the country, and are as follows: Pioneer Fireproofing Co., Illinois Terra Cotta Lumber Co., E. V. Johnson & Co. and the W. B. Owens Co., of Chicago; Henry Mauer, Mauer, N. J.; Standard Fireproofing Co., Woodbridge, N. J.; Lyth & Son, Buffalo; Federal Clay Manufacturing Co., five factories, Greentown, O.; Haydenville Mining & Manufacturing Co., Haydenville, O.; Delaware Clay Manufacturing Co., Delaware, O.; Lynch & Son, Washington, D. C.

The National Fireproofing Co. has been recognized as a sort of a trust in that branch of industry, and has for some years operated a number of plants, located respectively in Pittsburg, New York and Boston, but with the new acquisitions the concern will virtually control the fireproofing, hollow-tile and conduit business of the United States. This company seems to have had phenomenal success under the efficient management of Mr. Henry, of Pittsburg, and has grown from a very insignificant beginning to a mammoth enterprise, whose business now extends throughout the entire country; also, orders for conduits having been received which are now being filled and shipped to foreign countries. The hollow tile and fireproofing business has certainly made rapid strides in this country during the past few years and it is safe to say that the year 1901 was a record-breaker for that line of industry. This business is as a matter of course, the natural outgrowth of the evolution in building operations, created by the demand for high structures, and by having factories scattered over a wide expanse of country, the National company will certainly be placed in position to handle its affairs so as to effect a great saving in freight rates at least. And this demand for high buildings does not now seem to be confined altogether to the large cities, but cities of more moderate proportions are falling into line and buildings eight or ten stories in height may be seen shooting skyward in cities of from 25,000 to 30,000 inhabitants. It is also a matter of fact that hollow ware such as is made by this company is a recognized fire preventive, and not a few cases may be cited wherein buildings furnished with this character of material have withstood the fire's ravages and have remained standing when other adjacent structures, built on different lines, have been razed by the flames. In view of these facts it is safe to predict that the fireproofing industry will attain still greater proportions. The following board of directors was elected by the National Fireproofing Co. for the coming year D. F. Henry, W. H. Graham, J. J. Booth, S. C. Grier, T. J. Hamilton, Adam Wilson, Frederick Gwinner Jr., E. B. Alsop, W. A. Dinker, T. G. McCutcheon, H. M. Keasby, W. D. Henry, R. W. Allison, C. G. Jones and J. P. Robbins. The following officers were also chosen: D. F. Henry, president; W. D. Henry, vice-president and general manager; R. W. Allison, second vice-president and manager of sales department; H. M. Keasby, New York manager; W. H. Graham, treasurer; J. P. Robbins, assistant treasurer; E. G. Jones, secretary.

A fire occurred at the red brick works of Miller Bros., located in Charles St., Allegheny, Pa., causing a loss to buildings and machinery of possibly $3,000. The building containing the machinery seems to have been totally destroyed and a good portion of the machinery suffered considerable damage. The drier, which is of the hot air variety, and was built some years ago by Geo. W. Sharer, of Philadelphia, and is constructed of brick and iron, as a matter of course escaped injury. The origin of the fire is unknown. The work of cleaning away the debris and overhauling machinery is already under way, and no time will be lost in preparing the plant for an early resumption.

The bricks for building kilns and for other purposes at the new brick plant of the Bessemer Limestone Co., now in course of erection near Youngstown, O., are being supplied by the Douglas-Whisler Brick Co., of Vanport, Pa. It is estimated that about 1,000,000 will be required to complete the work. The brick machinery for this plant is being supplied by the Bonnot Co., of Canton, O., and the kilns and drier are being built by T. M. Wilson, of Layton, Pa. The plant is to have a capacity of 40 M. per day and the material to be used is a hard shale which overlies the vein of limestone now being operated by the company. The removal of this shale has hitherto been a dead loss.

It is the intention to construct a storm sewer in Toronto, O., at a probable cost of $40,000.

The Oakland plant of the American Clay Manufacturing Co., of Pittsburg, is again ready for operation after a shutdown of several weeks, during which time a considerable amount of repair work was done and some improvements made. The elevator system has been changed and instead of being driven direct by belts as formerly, each elevator will now be operated by a separate gearing. Two Dunlap screens have also been installed and a large clay shed has been built. It is also the purpose of the company to erect an additional up-draft kiln to have a capacity of 300 M. bricks.

The Stevenson Co., of Wellsville, O., is installing a second 9-ft. iron frame dry pan at the works of the Queen City Brick & Tile Co., Cumberland, Md.

A considerable amount of sewer work is to be done at Washington, Pa., in the near future.

The Empire O. plant of the American Sewer Pipe Co., of Pittsburg, has been closed several weeks and is undergoing a thorough overhauling.

A young potter at East Liverpool, O., named Heinrich Peterson, has received the cheering intelligence that he is about to come into possession of an estate in Denmark amounting to $15,000.

The machinery of the Excelsior sewer pipe works of the American Sewer Pipe Co. appears to have almost all disappeared, having been removed to other of the company's factories. It is evidently the intention to ultimately abandon the Excelsior works entirely.

At the annual meeting of the American Sewer Pipe Co., lately held in Jersey City, S. B. Goucher and R. Allison, both of Pittsburg, were elected to the board of directors. W. D. Eddy, of New York, was elected president to succeed Alvah Trowbridge, who held office for the year just ended. These were the only changes made in the official roster. It is said the meeting was very harmonious, in

fact much more so than either of the preceding annual meetings, and that the reports read concerning last year's business were of such a character as to produce a feeling of general satisfaction. It could not be ascertained what the percentage of earnings for the past year amounted to, but it is understood this exceeded the showing for previous years. This state of affairs, however, is not to be wondered at considering the advance made in the selling price of pipe early in the season (placing it at a much higher figure than has existed for some years past) and the great volume of business transacted. It is also understood that no changes will be made in the Pittsburg offices this year, at least so far as the heads of departments is concerned, which comes as a source of satisfaction to the latter, especially considering the fact that a variety of changes have followed as a result of elections in former years. I am informed by those in position to know that the Pittsburg offices were never so thoroughly systematized, nor manned by as competent a corps of officers and clerks as at the present time.

James Clarke, of Hanley, Staffordshire, England, who, for some years, has made semi-annual trips to the United States in the interest of a certain English pottery supply firm, sailed from England on January 25th on his usual mid-winter trip, on the Saxonia. After being out three days from land, Mr. Clarke was taken very suddenly ill, and expired in a few hours, his death being attributed to heart failure. The remains were buried at sea. Mr. Clarke leaves a number of orphan children, some of them quite young, the mother having met death more than a year ago, as the result of an accident. The death of Mrs. Clarke occurred in England while Mr. Clarke was in this country. On account of his extensive travels and education and his many years' identification with the industry, Mr. Clarke was a recognized authority in matters pertaining to the pottery business. He was also considerable of a linguist, being able to converse readily in a number of languages. This acquirement was of great benefit to him. Mr. Clarke was for some years engaged in the pottery industry in this country, his first place of residence after arriving here from England being in Trenton, N. J. After that he was located for a time in both Wheeling, W. Va., and Toronto, O., and from the latter place, some five years ago, he returned to his mother country, where he has since resided. The death of this gentleman is much lamented, and especially in the Ohio Valley, where he was so well and favorably known.

A sewerage system is being laid in one of the new additions to the town of Sheraden, Pa.

On July 1st, the Sebring pottery at East Palestine, O., will be transferred into the control of new parties, but it is understood the Sebrings, who built the plant and have operated it for a number of years, will retain a small interest.

The American Clay Working Machinery Co., of Bucyrus, O., will install one of its rotating automatic cutters in the building brick works of the Vanport (Pa.) Brick Co.

The sewer pipe business has been in such good condition during the past year that parties who have hitherto known little of that branch of industry have been attracted towards it, and it is now given out that quite a number of additional factories may go up the coming season to be erected by capitalists engaged in other lines of manufacture.

The plant of the Washington (Pa.) Brick Co. has been in full operation all winter. The capacity of the Pittsburg drier in use at this plant is being supplemented by the erection of additional tunnel. A new 9-ft. iron frame Stevenson dry pan is also to be installed, also an additional boiler.

Several round, down-draft kilns are to be built at the Calumet, O., works of the American Sewer Pipe Co., of Pittsburg. The Calumet plant is at present considered the largest and best equipped sewer pipe establishment in the upper Ohio Valley, and is in charge of Samuel McAdoo, of Toronto, O.

The union bricklayers of Steubenville, O., will demand this year an increase in wages of 45 cents per day. Heretofore the highest rate paid to that class of workmen in the city has been $4.05 a day.

The red brick works of the Colfax Brick Co., located at Colfax, near Fairmont, W. Va., will soon be placed in operation again after a prolonged idleness of seven months. The plant, which was formerly managed by a Mr. Williams, of Uniontown, Pa., will hereafter be in charge of L. H. Leitzell, of Scottdale, who with John Conn and J. C. Fulton, of Uniontown, own the property. In the past it has been the custom at this works to dry the bricks in an out-of-doors rack and pallet drying arrangement, but that system is now to be abolished and a tunnel drier erected. This drier is to be built by the Pittsburg Hot Air Dryer & Construction Co., and will, at present, be of small capacity, consisting of three tunnels 100 ft. in length. The cars for this drier will be supplied by the Ohio Ceramic Engineering Co., of Cleveland, and will be that company's single deck steel pattern, to be used in connection with foot pallets. The bricks here are made by the soft-mud process from plastic clay which requires no grinding.

The Pittsburg, McKeesport & Connellsville Street Railway Co. will build a line through Dunbar, Pa., and will pave its right-of-way with vitrified bricks the entire length of the town.

The Kenilworth (W. Va.) brick works of the Pennsylvania Clay Co., of Rochester, Pa., have been placed in operation after an idleness of some length. It is also understood this company will shortly start work on repairs to its plant situated near Monaca, Pa., which has been idle about two years. And as the latter factory is in a decidedly run-down condition on account of a collapse of some of the buildings, a considerable amount of work will be required in order to fit it again for brickmaking. The Pennsylvania Clay Co. has also just completed a number of improvements at its large Bradys Run paving brick works, including the installation of a Freese union machine with 75 M. daily capacity and an automatic cutting table of the same make.

Extensive improvements are being made at the Blackhorse works of the American Sewer Pipe Co., including the addition of several tunnels to the drier, which will also necessitate the purchase of quite a number of cars, the order for which has not yet been placed.

The work of converting the Eagle brick plant of the Mack Manufacturing Co., of New Cumberland, W. Va., into a sewer pipe factory is progressing quite rapidly and it will be but a matter of a few weeks until pipe making will be started. It is given out that the Etna brick works of the same company will also be subjected to a like change. Should this be done, the Mack Manufacturing Co. would have four sewer pipe factories, leaving but three of its plants in the Ohio Valley working on bricks.

The work of opening the fireclay mine of the Myers Clay Manufacturing Co., at Toronto, O., is being pushed with all practicable speed, but it will be some weeks yet before the clay is reached and sufficiently opened up to operate successfully. A slope is being driven and this will be of considerable length. This company has done nothing yet with respect to erecting the required buildings for its plant, and it is possible this work will not be commenced until the weather moderates.

A fire occurred at the McFetridge red brick works, located at Hite Station, Pa., on the Pennsylvania R. R. near Tarentum, entailing a loss of upwards of $1,000 to buildings and machinery. The fire started in the boiler room and it is intimated that a number of tramps, who were observed in that part of the factory during the night, had something to do with it. The product of the McFetridge plant consists of common shale building brick and the factory has been in constant operation throughout the entire winter.

Two "Perfect" clay screens are to be installed in the building brick works of the Iron City Brick Co., Pittsburg.

Quite a number of Pittsburg brickmakers attended the N. B. M. A. convention at Cleveland, and all express themselves as being highly pleased with the meeting. In this connection it is interesting to note that the place of the meeting this year was very well fitted for the purpose, and the attendance was larger than at any previous convention of the association. The meeting was also voted a very interesting one in many respects. It is a matter of fact, that while almost all brickmaking machinery concerns are usually represented at the conventions, and a great amount of hustling for business is done, very few contracts are closed. A great amount of missionary work is accomplished, however, and that as a rule results in a considerable amount of fruit at a later date. In this particular this year's convention seems to have been no exception, and while a comparatively small amount of business was really closed, the machine men express themselves as being highly pleased with their work and are hopeful of securing numerous orders in return for their efforts. It seems that brickmakers do not attend these gatherings with a view to making purchases of machinery, but on the other hand they usually go to the conventions either for an outing and general good time, or else to gain pointers in the matter of brickmaking and brick works euuipment. Some look forward to these meetings with pleasant anticipations and one or two remarked to me that this was the only holiday they took during the year.

The plant of the Kensington Pa. Brick Co., which has been idle for some weeks, is again running full time. S. H. Robinson, of Pittsburg, who has had general charge of the concern for the last two years, has resigned to engage in another line of business. At the Kensington plant both common and face building bricks are made, the latter in three shades—red, buff and gray.

The practice of building veneered brick houses in Pittsburg seems to be gaining ground quite rapidly, and it would seem the greater portion of residences in the best suburban districts are of that character of construction. While certain advantages are claimed for veneering in the manner indicated, the practice seems also to possess its disadvantages. It is held that veneered walls constitute more healthful residences than the solid brick by virtue of its non-retention of moisture, but on the other hand it is the opinion of insurance men a veneered house is a veritable fire trap. It appears the insurance on this class of structures is classed at the same rate as frame buildings, so that in this respect nothing is saved. I am informed that steps are now being taken looking towards the introduction of a bill in the Legislature at Harrisburg, Pa., with a view to putting a stop to the erection of veneered buildings, the reason assigned being that already suggested, namely—the unsatisfactory fire protection afforded. It is claimed to be far more difficult to extinguish a fire in a building of this character than it is to battle with the flames in a burning frame structure, which is usually accessible from the outside, while, where a fire is discovered in a brick veneered building it is almost impossible to accomplish anything on the exterior with respect to extinguishing the fire, on account of the brick wall encountered. It is also a matter of fact that fires are usually confined to the woodwork between the brick and plaster—a very awkward place to reach. In view of these facts it looks as though the passing of a law of the character indicated, might be considered wise and timely legislation and I am safe in saying brickmakers, at least, will raise no objection to its passage since the veneered brick buildings, have, in a large measure, taken the place of solid brick structures in the residence districts.

The American Sewer Pipe Co., of Pittsburg, has secured a large order for paving bricks to go to Wheeling, W. Va.

A number of brick roof-supports have been placed in the clay mines of the Toronto (O.) Fire Clay Co. This arrangement is something comparatively new and takes the place of the usual form of supporting the roof of mines with timbers. The brick pier is also claimed to be superior to the other, both on account of its strength and longevity.

A series of bond issues have been authorized by the council of Alliance, O., aggregating $125,000, the proceeds of which will be employed for street improvements.

A number of improvements are to be made at the fire brick works, at Irondale, O., recently purchased by Capt. John Porter, of Wellsville. It is the intention to abandon the hand-molding process of brickmaking and it is possible a soft-mud machine may be installed. It is also likely a tunnel drier will be erected.

Protest was entered at Columbus, O., by a delegation of East Liverpool potters against the passage of the Willis bill, which proposes a tax of one-tenth of one per cent on the capital stock of corporations.

A peculiar accident occurred at a brick works near Pittsburg which might possibly be attributed to inferior setting. About 25 M. bricks tumbled over after being set in a kiln and partially buried a number of workmen, some of whom were considerably injured. It is the custom at the majority of Ohio Valley brick works to have labor performed by "set" work and on this account it frequently occurs that the work is not as thoroughly done as it might be, especially if the foreman absents himself very much. I do not mean, or wish to be understood, however, as being opposed to that method of doing work, as I consider it the most advantageous system in vogue, for both employer and employe, and in fact it is really the only correct way of doing work in any branch of manufacturing business, and that it is the most profitable system, at least for the manufacturer, is evidenced by the fact that it has been adopted by all the largest concerns in the land, in all line of industry. And especially in the matter of brickmaking does this method of allotting to each workman a certain amount of labor to perform each day seem to be applicable and is certainly an economical measure. But at the same time it does seem to be a matter of fact that where this system is carried on, in order to guard against the work being slighted, great diligence is required on the part of the superintendent or foreman.

There is quite a controversy going on between employes of the Chelsea pottery, at New Cumberland, W. Va., and those at the American China Co.'s plant at Toronto, O., as to which crowd is entitled to the laurels for fast work. It appears that a certain workman at the latter plant made 60 saggers in one hour, as a result of which he claims to have broken all past records for expedition. To this assertion the Chelsea potters have taken exception and wish to wager that they can beat it. Be this as it may, the Toronto man who produced the 60 saggers in that many minutes, is certainly no novice at the business.

In addition to those already mentioned, there are one or two other brick manufacturers in the Ohio Valley who talk of converting their plants into sewer pipe factories.

Thomas Price, who for some years has held the position of superintendent of the American China Co.'s pottery, at Toronto, O., has resigned to accept a similar place with the Chelsea China Co., of New Cumberland, W. Va. Mr. Price is recognized as being an expert in that particular line of work.

A brick plant is to be built near Monongahela City, Pa., by a company to be known as the Monongahela Valley Brick Co. The company is composed partly of local residents, but the principal portion of the stock is held by Pittsburg business men. Work is to be started soon on the erection of buildings and the installation of machinery for a plant that is to possess all modern appliances for carrying on a successful business in the manufacture of building bricks from shale. The machinery and entire equipment will be supplied by E. M. Freese & Co., of Galion, O., and will include the following—one 150 h. p. short-stroke, slide-valve engine, two 100 h. p. boilers, one 9-ft. iron frame dry-pan, one "Perfect" clay screen, one large union brick machine with automatic cutting table,

a 5-tunnel Pittsburg hot air drier, equipped with double-deck steel cars. It is the purpose of the company to equip a plant to turn out 30 M. bricks daily at the start, but the power and brick machine are capable of producing twice that capacity. The material to be used is a hard shale and will doubtless prdouce an excellent quality of building brick.

It is stated that a pottery for Salineville, O., is now an assured fact and that work on the necessary buildings may be started at an early date.

The American Cement Tile Co., which has been in business in East End, Pittsburg, for a number of years, is about to remove its machinery to a site at Wampum, Pa. Up to this time, business with this concern has been carried on in a very small way, but additional money is now to be invested in the enterprise by a number of outside capitalists and it is the purpose to erect a large plant and conduct quite an extensive business in the manufacture of roofing tile. The material from which this product is made, consists largely of cement and sand and the process of manufacturing appears to be somewhat of a secret. From what I learn, however, the system has passed beyond the experimental stage and the roofs of a great many buildings of different kinds, have been covered with this class of tile, and the material after a period of hard usage shows no indication of either wear or disintegration. It appears that if the tiles are properly seasoned no weather conditions will affect them, but on the other hand, if the work of seasoning is not thoroughly accomplished, then trouble will, as a matter of course, ensue. The tiles are made (at present in a kind of a crude way, most of the work being done by hand) on steel plates. These are hacked in a system of racks where they are allowed to remain for possibly two days, when the tiles are removed from the plates, the former are placed in tight hacks, and the latter sent back to the molders' bench for another filling. Although the tiles are apparently solid and hard by this time, the work is by no means completed, as it requires some six weeks' time yet before the material is ready for the purpose intended, and during this entire time more or less attention is necessary in order to properly complete the work of manufacturing. During this period of time the process of seasoning is carried on, and this seems to consist of a sprinkling of the material daily with water. It is said the tiles after passing through this process, possess wonderful strength and are not easily fractured. The tiles are made in a variety of sizes running as large as 26 in. wide by 48 in. long, and are also produced in different shades. It is estimated the cost of roofing a building with this class of material is about equal to that of slate of a good quality, but that the former will wear longer than the latter. In view of its many advantages, if the business and selling this class of roofing is carried on systematically and energetically, there is certainly an excellent field for it in the vicinity of Pittsburgh.

The brick plant of W. G. Paul & Co., Massillon, O., has been sold to E. C. Segner, J. A. Shoemaker, W. C. Jacobs and R. H. Evans, for a price approximating $15,300. The purchasers will increase the capacity of the plant. W. G. Paul will be retained as superintendent.

Shaffer Brothers, brickmakers of Dodsonville, O., are burning 200,000 brick to be used in the erection of new buildings at Fayetteville.

Hoffman Continuous Kiln.

While we are giving our attention to the many continuous kilns placed on the market it must not be forgotten that Hoffman continuous kilns are still being constructed in Europe and that a desire for these kilns has been established in this country. Wuerz & Kottenhagen, architects and patentees, St. Louis, Mo., are the sole agents for the Hoffman kilns for the United States, Canada and Mexico, and their specialty is the construction and building of kilns and furnaces. These gentlemen have had many years experience in the erection of kilns and hundreds of kilns erected by them in European countries in which are two of the largest now in existence, are still giving the best of satisfaction in producing a high percentage of first class wares with a minimum expenditure of fuel. Wuerz & Kottenhagen claim that the kilns they erect will burn 1,000 brick with about 112 lb. of coal. The increasing attention given by the American clayworker to the subject of burning bricks by the continuous process augurs well for the prospects of constructors of kilns of this type, and Messrs. Wuerz and Kottenhagen give their work of construction personal attention and guarantee entire satisfaction.

Bricks to Burn.

The American Clayworking Machinery Co., of Bucyrus, O., has recently received inquiries for machinery to make bricks which are not only to be burned, for that is not unusual, but could be utilized to burn other bricks with.

E. J. Hoffman, of Omaha, Neb., a Chicago and Northwestern railroad engineer, who retired from his vocation because of ill health, has invented a fuel that he asserts is composed of clay to the extent of 90 per cent.

To mold this clay-fuel into bricks of convenient shape for use in stoves, furnace or grate, the Bucyrus machinery may be used.

Mr. Hoffman says that one day while at work in the shop there was accidently revealed to him a peculiar action of certain chemicals and gasoline. Eagerly he followed up the clue with numberless experiments, until finally he is enabled to give to the world a fuel, he declares, cheaper than coal and better than coal.

The fuel burns in a stove, grate or furnace readily, it creates no smoke, no cinders, and burns to white ashes, 20 lb. of the fuel producing only a quantity of ashes that may be held in the palm of the hand. In the combustion the fire literally consumes its own ashes, and a ton of fuel will go further than two tons of the best coal, producing five times the amount of heat that coal creates. One pound of the strange mixture will suffice to keep the kitchen range hot for one hour.

A recent test of Hoffman's clay coal in the furnace of a large boiler developed that fact that 250 lb. of it created 30 per cent more steam and lasted longer in burning than 600 lb. of first quality steam coal.

The invention, it is predicted, is destined to solve the fuel problem for the whole world, inasmuch as the product may be manufactured 1,000 miles from an oil-producing locality for about $2 a ton. Near an oil field it can be made for one-fifth of that price approximately.

For factories and manufacturing establishments it is proposed to have a plant at or near the furnace doors. Dirt will be hauled, treated in a few moments and the fireman shovels his fuel under the boilers. With the dampers open can be produced a heat the like of which has never been secured from coal, or, with all draft closed, one may have a glowing fire not unlike that of anthracite coal is a base-burner. For household use it is proposed to subject lumps in molds to a pressure of 1,000 lb.

It is reported that two Chicago-Omaha railroads on February 1 began using Hoffman's fuel for a thorough test in the locomotives, and that at the same time the immense packing house plants of Armour, Cudahy & Swift at South Omaha tested the invention.

Ninety per cent of clay is, however, an insuperable barrier to preliminary credence in this fuel as a practical problem. We are afraid that our faith must be considerably smaller than the scriptural grain of mustard seed for while it may be so we "hae oor doots."

BRICKMAKING IN THE SCANDINAVIAN COUNTRIES

BY CHRISTIAN FR. LEGER.

VII.

Our peregrination through Denmark now leads us from Funen to Zealand, the largest island of the country. In no lesser degree than the parts already visited it affords excellent conditions for scientific brickmaking, the rude material being at hand almost everywhere, though different in quantity and of a highly varying quality. On Zealand we will therefore find a great number of brickyards, from the smallest to the largest, quite small yards with a produce of 300,000 to 400,000 bricks a year and large ones of 25,000,000 capacity. Here too in all essentials the type is the same as formerly described, the way of producing also, but competition is more intensified, as the island of Zealand, only 60 miles wide, on its eastern side bears the metropolis of Copenhagen, which town through its phenomenal enlargement year by year is demanding any amount of building materials, bricks being by far in the predominance. The neighboring Sweden is contributing considerably to the supply, making the mutual rivalry among the Zealand manufacturers so much the more intense. As a rule the wages of labor are lower in Sweden than in Denmark, so that a great number of bricks from the yards along the not very far off Swedish coast are thrown into our market with profit, especially so as the importation of bricks is duty-free. The great point for the Danish manufactories is therefore, how large their charges of conveyance are, for in these bad times, when prices are low and demands of long credit large, produce will not stand high extra expenses, especially when as freight, etc., they must be paid cash and in advance. The difference is somewhat equalized, it is true, by the circumstance that wages are generally lower the more distant the place of produce is from the metropolis, but still it is only within a certain and not too wide limit that the bricks are able to bear the charges of conveyance furthermore increased by the inevitable and often several times repeated re-loadings they must suffer before they reach the place, where they are to be used. The large and middling-sized brickyards have therefore as far as possible been built so near the railways that by way of rails they are able to get their articles carried to their customers in the easiest manner. Through machine-work and the continuous kiln, used everywhere in such yards, they are furthermore able to carry through so great a regularity, that they may pledge themselves to sending off certain quantities at fixed times. Hereby several advantages are gained, among others, that they have always empty railway cars at their disposal, so that the loading may take its place without interruption straight from the kiln, to which the rails are leading directly from the main line.

FIG. 1—THE "DYSSEVÆRK" BRICK WORKS, COPENHAGEN, DENMARK.

But to be able to partake in the race to the places of consumption it is necessary to work hard and persistently, in other words, the charges of conveyance must be brought down to the least possible. Not everybody will understand to limit himself without making too much out of it, and this will now and then show in the inferior quality of the produce. But all in all, it must be said, that in exterior as well as in quality the bricks rather exceed what might be expected, from the reason only that they are often loaded into the railway cars as hot as they are taken from the kiln. But beside the drawbacks that are inevitable where there is a hard competition, and of which those felt the heaviest are the low prices and, in spite of hard work, a relatively small profit, on the other

hand many concerns will rise, able to watch their opportunity and utilize the rude material and every facility in a far more intense manner than would ever be the case under more quiet conditions.

Approaching to Copenhagen the yards increase in number, though the clay is getting more and more lean and more and more mixed with unserviceable matter; in the immediate neighborhood of the town it is highly polluted. Especially to the north of the metropolis the yards are grouped most thickly, but also to the west

FIG. 2—THE "DYSSEVÆRK" CLAY BANK.

and south of the town several yards are found. A single one, "Aldersro Teglværk," is even placed within the town itself. It is true that in its time it was built on a flat field where nothing else was built, but as the enlargement of the town went on, it has been surrounded by complexes of houses and streets, so that only few people will know where to find it. Accordingly it is splendidly situated as to the selling of the bricks, and though the clay is of so polluted a condition that all of it must be slummed, the yard has always paid pretty well. If we continue our way, passing this yard, along the so-called king-way, with only short intervals we will reach the "Mollegaarden," "Tjornegaarden," "Dysseværk" and "Ornegaarden," while one yard, "Vintappergaarden," much in use once and very well known, is now given up. All these yards are situated within three-quarters of a mile from Copenhagen and immediately by the most frequented highroad of Zealand. Only "Ornegaarden" is in possession of a material so tolerably pure, that it may be worked without previous cleaning, while on the other yards it must be subjected to a radical washing before it is fit to be used. When during the present dead-water of building industry they are able to be kept going, even if the net profit by far is not great, this is only due to their situation so near the metropolis, the latter and the thickly villa-built environs forming their market and reducing the charges of conveyance to almost nothing. The produce of these yards is sent off on carts drawn by two horses along excellent roads, 1,000 bricks at a time, the gradual supply which in this way is rendered possible is a great advantage to the yards. Generally the building places have only a very limited space at their disposal beside the very building area, so that it is very difficult for them to receive larger parts at a time, but must stipulate that the materials are furnished equally during the day in close accordance to the demand.

Among the above mentioned yards we will stop at "Dysseværk," which is of rather new date and interesting to get acquainted with, as in far higher degree than the other and older yards it is arranged upon the whole according to the demands of the day; it is a most modern yard. It is only a few years old, built and still owned by the present Danish Secretary of State for Home Affairs, solicitor of the Supreme Court, Alberti, who has spared nothing to fit it out in technical regard in the best and most serviceable manner. At first slumming was only meant necessary to a smaller part of the clay, but it soon proved to be so thoroughly polluted that all the produce must be worked in slummed clay. It contains from 40 to 60 per cent of unserviceable matter for brick industry, sand, gravel and stone, for which materials, however, there is a rather lively demand and ready sale. On account of the relatively high situation of the spot there were considerable difficulties to surmount in producing the large quantities of water necessary for such a slumming process. The water is taken from a neighboring lake through an afflux debouching in a bog on the area, from whence it is pumped up. This way of supplying gives, however, the trouble, that it is depending on the level of the water in the lake. If this lowers below a certain limit the afflux will stop by itself, and as such a calamity mostly may be apprehended during the dry periods of summer, when the work was to go quickly from the hand, it was a vital question for the factory to make itself independent of it. This has been carried through by the building of large reservoirs that are filled, when water is in abundance and afterwards used to supply the demand and keep the work going.

In a vertical cut the clay-pit shows about 5 ft. of red clay under a few feet of mold, and under the red clay about 20 ft. stony, limy and sandy marl. Besides, at a considerable depth there is a mighty stratum of relatively pure gray clay, but this is covered by so large masses of stone and sand that it is not worth while digging it out. The clay is grubbed out by hand, and when relieved of the coarser pollutions and larger stones it is taken by means of rails and chains to the slums. There are three slums patented by a German firm, Lüdiche in Werder am Havel; they differ rather essentially from the old-fashioned, commonly used and formerly described apparatus. They are considerably larger and constructed in a way that makes the clay-slum pass through the bottom of the basin into a sort of brick-laid well, whence it is again lifted up by centrifugal pumps to the outlets which take it to the basins. The newly dug mass of clay is thrust through grates that will

FIG. 3—SLOPING ROUND SCREEN AT "DYSSEVÆRK."

retain the larger stones, into the slum; this facilitates the work from the beginning. The rest of the refuse which by the quick movement of the slum is flung towards the center of the basin, will settle there and is cleared away by a cup-lift going round two sets of tables, the upper of which is spun by a conical toothed wheel connected with the vertical slum-axis to which the harrows are fixed. By a very simple mechanism the lift is put into play, when a clearing out is wanted. On the level with the upper border is

fixed a pivoting, sloping round-screen (Trior) in which the refuse is gathered and whence it passes through several sets of partitions with meshes of different width into the surrounding sieve, falling down into carts ready to receive it, carefully assorted and ready for sale. The clay-slum is bedded in seven basins to an aggregate area of 160,000 sq. ft.

The produce of the brickyard is brought out both by hand and by machine. For the handwork the clay is furnished from an up-

FIG. 4—THE BOILER ROOM AT "DYSSEVÆRK."

right pug-mill, likewise patented by the above mentioned German firm. Above, it is provided with a funnel whence the clay is led from the basins and into which it is thrust after being duly mixed. It will furnish material for 20,000 bricks a day. When after the molding the bricks have grown sufficiently stiff, they are beaten with a vigorous slap between two boards and placed for drying on loose wooden plates of the size of the brick on covered shelves in the barn. By this proceeding the hand-made bricks will be smooth and sharp-edged, they have an exceedingly fine and regular look and are very strong, though the clay is of a rather short character. The three brick-machines turn out 75,000 bricks in a 10-hours' working-day. Generally some dry clay powder is added to the clay for these bricks, as they demand a stiffer consistence; to this end dry rude lumps are used and the upper crust in the basins, after being crushed, ground and sifted in a disintegrator. These different working apparatus are installed in a building so that the produce may be carried on uninterruptedly during unfavorable weather. Besides the house contains both smithy and repairing shop as well as two high and low-pressure machines, together developing 150 h. p. With the engines is connected a dynamo, the power of which is utilized through smaller motors for the pumping of water and the hoisting of green bricks in the upper part of the drying barns. Besides it is feeding the electric incandescent lamps in the machine and working rooms and the arc lights in the clay-pit, so that the work may be carried on through the night if necessary.

The drying of the green bricks is done by natural process in shelving-barns of two stories, some of them provided with jalousie walls as a screen against burning sun and high wind. As above mentioned the whole establishment is built on a bare hill without shelter from any side and much exposed for the wind. The clay, being of a short and sensitive character, is unfortunately very susceptible to these influences and will easily break when not carefully treated, but if on the other hand the drying process takes place evenly and regularly, the produce turns out both strong and fine. The continuous kiln contains 18 divisions each holding 19,000 common bricks and has a draft above in the vault by means of movable iron pipes. Six divisions a week are burnt, and for fuel "smalls" and screened steam coal are used. The consumption of coal is about 325 lb. per 1,000 bricks. The produce embraces besides 250,000 partition bricks, 6 in. wide, 5,000,000 bricks of common shape, of which one-half must be put down as first-rate red face-bricks. During the working season the yard employs about 100 men and some women, to whom the slapping of the hand-made bricks is left. They are paid weekly with their full earnings, generally calculated after jobs fixed by agreements for the special labors. Engineers and stokers, however, have their fixed wages and free residence on the works.

Although this part of Zealand, besides the yards already named, is so rich in them, and they so mutually different, that we might find ample subjects for pen and camera and yet each time show something new and peculiar that would be of interest, yet we prefer to make a leap to another part, where the clay-substratum is as pure as may ever be wished. To American notions the distance is not very large, a little more than 40 miles from Copenhagen only. But as before mentioned, the natural richness in clay is often so grotesquely mixed with most unequal sorts and found so singularly different, that also at much closer quarters, nay, even amidst the most polluted rude material may be found spots where slumming and other formalities are only known by name, and the finest produce, so to speak, is almost dug immediately out of the ground. The real apprehension of what this signifies will not be known till the season of tribulation for the brickmakers will come. The advantages are so evident and great where such blameless material is found, that such works far easier than others will keep their ground and bear the brunt of bad times. If they are managed by competent, experienced and industrious men, they will easily go ahead and hold their own under conditions which under less favorable circumstances might be critical enough. Still it is not only because these advantages here must be supposed to be united in the fullest measure that we make such a jump. For much nearer and with far less trouble we might find yards the leading and produce of which in no regard is behind, and in so far with perfect justice they might expect to be drawn forth. But we have another motive than this only to give an account of an in-

FIG. 5—THE BRICK MACHINES AT "DYSSEVÆRK."

dustry that in its line approaches the ideal, it will serve our motive: to represent Danish brick industry from the small to the great, from half primitive old-fashioned works to highly complicated factories to stop here at this establishment as a resting-point on the road. In the foregoing we have had to do with productions of 500,000 to 5,000,000 of bricks; now we shall mention those of 10,000,000 and more. In our little country the choice is not large, but neither is it difficult.

By railway we will steam away from the east side of Zealand to "the Northwest," and stop between the towns of Holbæk and Kallundborg, in an undulating woodclad country, where hills and valleys offer a rich variety to the eye, and a luxuriant beautiful scenery is smiling to us from everywhere. It is an exceedingly fertile and well-cultivated country we are visiting here, and it is clearly to be seen that the inhabitants are rather well off, thanks to the sources of prosperity which so to say are issuing out of the black earth and lie before us in broad daylight. But underneath the swelling and fat cover another treasure is hidden, here and there drawn out of its layer and utilized in many ways. Here is found the costly pearl for which the brickman is always seeking, the dream of his life, putting thought and forces in motion and claiming all his spiritual and bodily energy. Seldom the lithe and coveted clay is found better, finer and more beautiful than here where the joint stock company, "Knabstrup Teglværk," by every means is trying to render profitable the rich area on which it is built. Having dug down through a few feet of mold we meet directly the red clay, 3 to 5 ft., in a vertical cut, clean and pure with just a little difference in quality and as made respectively for roofing tiles and the finest face-bricks imaginable. Then comes a 4 to 5-ft. deep belt of very fat yellow material mixed with marl but quite stoneless, and then a third sort, potter's clay of an exceptional goodness. Its depth varies from 12 to 15 ft., and just under it is a stratum of 8 to 10 ft. of finely grained blue sand. As will be seen great riches are hidden in this smiling country, and it seems that there is no end on them, although the yearly production reaches 11 to 12 millions of very different but exceedingly fine and sonorous produce. Great quantities of the plastic, pure and to a high degree easily formable clay are sold in natura to the potteries, modellers and sculptors of the country everybody giving it the most unqualified praise. The material being so absolutely pure, slumming of course is a thing out of question. The manager, the director, H. H. Schou, a man in his line highly respected and well known, understands with energy and skill to make the most of his excellent rude material, so that Knapstrup is reckoned among the best paying yards in our country.

The yard is in two divisions, the first of which produces common bricks, roofing tiles and drain pipes. A brick machine turns out 30,000 common bricks a day, another turns out red face-bricks, and on a rolling mill Dutch tiles and drain pipes are made, while two presses produce the so-called groove tiles that more and more have gained their ground. With the exception of the drain pipes all the articles are burnt in a Hofmann kiln with 14 divisions each for 10,000 bricks. During summer time it turns out 120,000 a week with a consumption of fuel of about 300 lb. of steam coal per 1,000. The continuous kiln of the second division is provided with an artificial drying apparatus after Cohr's system, making use of the waste heat of the kiln. The construction is here somewhat improved, among other things the vapors are removed through a common sucking-chimney occupying the whole length of the apparatus. In Cohr's system the drying rooms are originally divided from the superstructure of the kiln by a gallery or wheeling passage along which the green bricks are conveyed. At Knabstrup, on the contrary, the gallery is outside the drying-rooms, which thereby further may be isolated from the outer air. By this arrangement a considerable mass of heat is gained for the benefit of the drying. At the end of the gallery is placed a brick machine which as the above mentioned turns out 30,000 bricks a day. But with the finer produce in view which is aimed at here, it is provided with a pugger, two pair of rollers and below a mill on which the mold is placed.

By chains driven by machinery the clay is taken directly from the digging place to the clay pit above the brick machine. On the gallery the clay carts are rolling along a rather high bridge to their destination, where they automatically rid themselves of the chain, so that one man is sufficient to attend the cart and the mill. The continuous kiln, the firing basis of which is on the level with the floor of the gallery, has 16 divisions each holding 11,000 bricks. It turns out 170,000 to 180,000 bricks a week, among which also the drain pipes that, as may be remembered, are made in the first division. By dint of the drying apparatus connected with the kiln they are able to continue the work even through the coldest months of winter. This ingenious arrangement, utilizing every atom of free heat from the kiln that otherwise would be lost, as well as the really phenomenal good quality of the clay, renders it possible at all times to keep pace with the burning, so that dry bricks are constantly at hand ready to be put into the kiln. Often it is even necessary to store a surplus of green bricks. A very high wooden barn in several stories has therefore been built for this use in the immediate neighborhood of the drying apparatus. The produce from the first division on the contrary is all in all dried in the natural way in common open barns and is first placed in 6 courses on the floor; in half dry condition they are then

FIG. 6—A GENERAL VIEW FROM KNABLTRUP TEGLVÆRK.

piled up in the so-called chimneys through which a lively draft soon will make every rest of humidity disappear. The burning apparatus are completed by a third down-draft kiln, Otto Bock's construction, especially used for burning roofing tiles, and it gives excellent results.

Besides a smithy and repairing shop there is also a steam sawmill, producing all the wooden necessities of which a brickyard has so many and to which the materials are easily got from the neighboring woods. A combined high and low-pressure engine of 120 h. p. sets the whole thing going, but for instance to the brick machine on the gallery the power is transmitted by a transmission rope. The production embraces common bricks, yellow and red face-bricks, drain pipes, wedge bricks for wells and several other sorts especially demanded by the country people. Of specialties is produced a partition brick with two throughgoing holes, which on account of its slight weight has won much appreciation. The burning result shows 50 to 75 per cent exceedingly clean colored face-bricks. The number of hands in the proper season is about 100.

The sale to neighboring consumers who fetch the articles themselves, is rather lively, but the main part is sent by railway to Copenhagen. The local railway station is about one mile from the yard, wherefore with great costs for the latter a line of rails has been laid, along which the bricks are conveyed to the main line. On the yard's own area the line is submerged, so that the bottom of the carts are on the level of the ground, and the bricks are wheeled directly into the wagons. The loaded railway cars are by horses drawn to the station.

The Brick Wheel-Track Road.

The following paper was presented to the Good Roads Congress at Buffalo, N. Y., which met September 16-21, 1901, by D. N. Long, of Buffalo, and is sure to be of general interest to our readers

In nearly every other branch of civilization wonderful progress has been made, and especially during the last fifty years, while advancement in the art of road building has remained nearly at a standstill.

That the art of road making is susceptible of nearly as great improvement as most other lines of industry has finally been demonstrated by the introduction of the wheel-track system, whereby very superior roads can be constructed at a fraction of the cost under the old-time method in such general use today.

The agitation and investigation of the road question by the United States Department of Agriculture during the past ten years has brought out the fact that the people of this country are needlessly losing over $600,000,000 each year because of our bad roads. making this the most important economical question before this country at the present time. The advent of the bicycle, followed by the automobile and the free rural delivery of mails, has greatly stimulated the agitation of this question.

The fact that our post-office officials claim that mail could be delivered to nearly every home in this country without cost to the national treasury if we had good roads has also been a powerful stimulant toward the energetic and earnest study of the road problem and is an instance of its far-reaching scope and importance.

Nearly two years ago an investigation of this wheel-track system was made by the office of road inquiry of the United States Department of Agriculture, resulting in a test piece of this road being built in the department grounds at Washington, D. C., in the early part of 1900, which has been in constant use ever since, with the most encouraging results.

The fact that all loads are hauled over very narrow parts of the road—railroad cars, for instance—indicates that if that narrow portion can be properly adapted to carry the load on our common roads very new and important results may be secured.

It is also well known that wagon wheels tend to form and follow ruts in the roadbeds. Now, by simply constructing a shallow, even, and nonwearing rut or slight depression for the wagon wheels, the ideal and natural conditions for road construction are largely met.

The brick wheel-track road accomplishes these results in a remarkably efficient manner and at so low a cost as to almost seem incredible. At the same time an even surface for the wagon wheels is provided, and excellent drainage is afforded to the whole roadbed.

A wheel-track road can be built for about $1,500 per mile in all sections where paving blocks can be had for $15 per 1,000, and should last for many years without material expense for repairs. This cost of construction could be reduced to a few hundred dollars per mile if the plan for using convicts is adopted. Even at this low cost a permanent road is secured of such smoothness that several times the load can be hauled on it with the same motive power required on the average stone or earth road, while all mud, dust, and objectionable ruts are avoided.

This wheel-track system gives a wheel-carrying surface nearly equal to the steel rail in its evenness, with nearly the same wearing qualities, but without its liability to rust. In fact, many of our best shale paving bricks are composed of 15 to 20 per cent of iron; so the wearing qualities of these roads when built of shale brick are largely due to the presence of iron in the wearing surface.

The development of this system has made practical another great advance in road construction. As a result there is no reason why, after this method, our convicted criminals and vagrants should not be employed to construct the finest roads in the world throughout our entire country, with scarcely any assistance from our taxpayers.

The suggestion by the United States Department of Agriculture that the long-term convicts be employed in the penitentiaries and workhouses to make the brick and other road materials and the short-term convicts to construct the roads is an eminently pracical one, by which the taxpayers of this country could probably make a clear saving of $7 for each individual in the country on the average. Instead of this they are now paying large sums to support these people in addition to large sums for roads.

Convict labor, thus employed, would not, properly speaking, come in competition with free labor, as if this work is not done by them it probably would not be done at all to any great extent, and, besides, every workingman, no matter where located, will be directly benefited by the improvement in our public roads.

A sample of this wheel-track road system has been laid in the street adjacent to this building, to which your critical attention is particularly invited. By this system this country can likely secure by far the best roads in the world at so low a cost as to be insignificant.

The American Blower Co., of Detroit, Mich., is sending out its illustrated sectional catalog number 135, showing full lines of the various "A. B. C." hot blast heaters for the heating and ventilation of public buildings and the drying of materials of all kinds. The company also does an extensive business in exhaust fans, dry kiln fixtures, steel plate fans and all mechanical draft apparatus, steam traps, steam engines, vertical and horizontal, automatic and throttling governors. The "A. B. C." hot blast heater is illustrated in detail showing all its different combinations and its general adaptability to any specific purpose.

The Michigan Sand Lime Brick Co., Saginaw, Mich., has been incorporated with $50,000 capital to erect several factories in different parts of the state for the manufacture of brick from sand and lime. F. W. Hubbard, of Bad Axe, Mich., is president.

Brickmaking as Seen from the Office Window.*

BY N. JOESTON, SIOUX CITY.

The men who assemble at our annual conventions are mostly well versed in the different qualities of clay, its composition, of shale, or loam, contents of silica and magnesia, the color it will burn, in fact some of them would make a valuable acquisition to a State Geological dissecting room. Others again have combined with this knowledge, what class of machinery is best adapted for certain kinds of clay, and sometimes become so enthusiastic in clays and the process of making it into brick, that, if they should have a mishap to the business end of their engine shaft, they could easily be utilized to keep things going until necessary repairs were made.

As a consequence of constant association of clay and machinery, these brickyard managers have partaken to a great extent of the material they handle, and become rather earthy, and do not account the office business of very much value, in fact sometimes they are in doubt whether the office man does more damage to the furniture or to his clothes. Being themselves very much disinclined to close application of deskwork, when after a long siege of hand work the office man is obliged to take a vacation, in order to gather his shattered nerves together again and the clay manager has to lend a helping hand in the office, he finds it not to be all play. When the office man returns, instead of his books being written up, he is handed a lot of papers by the clay manager with the remark, "I do not know whether I would get these things right or not, so I kept them on these papers for you to arrange." And then after a while to take the place of his "Welcome home," the clay manager will incidentally remark, "There is a ——— sight more work in this office than I had any idea of," and with this parting shot the clay manager hies himself off again to his clay, to earth, and regales himself by counting how many brick come through that machine a minute, while the office man sets himself about the laborious task of getting the fragments of the business together again.

In these two or three years of exceptional prosperity it is not to be wondered at that these clay managers are getting egotistical, that they feel as if they were the whole thing, so to say, when everything is coming their way without even the asking for it, when it is not the question whether there is money enough for the pay roll, but rather how much is the surplus?

The majority of men who attend our conventions have been in the business a decade or more, and have therefore seen other times than at present, times when on the morning of pay day the clay manager would come into the office and consult with the office man as to how enough money could be got together to pay off in the afternoon.

The writer remembers very vividly some experiences of the early 90's when after a long pursuit of the contractor in the suburbs, finally found him, and after giving him some taffy about the beauty of the house he was building and his artistic taste, finally very timidly edged up to his errand that it would be very acceptable if he could accommodate him with a little money for the brick furnished in the house that was nearly completed. And this great contractor would swell up in indignation that he should be asked for money. He had no money, the owner of the house had the money and he paid all bills. If my bill was correct he would O. K. it and I could go to the owner and get the money. Away the collector went joyously, thinking he would have an easy time now of getting the money. Finally he finds the owner, to whom he presents his bill, and the owner looks askance and after a little hemming and hawing, and being further pressed to the point, finally blurts out that he is to get the money from the Building Association. Upon the interrogatory of when that will be, he cannot say, but volunteers the suggestion, "If you can get it any sooner than I, I will give you an order on them." At this stage of the game the collector is not so sure about his footing, and leaves the owner with the remark "that he will see the Building Association." The Building Association is found upstairs in some back room, with a clerk in attendance. Upon interrogation of when Mr. Jones is to get his loan, the languid answer comes—"Mr. Jones? Yes, his application for a loan is in."

"Yes, but when will be get his money?"

"Well, I don't know. There will be a meeting next Tuesday at which time we expect some money to be paid in on stock subscription."

::Then you have not the money on hand?"

"No, it has to be paid in first."

"And how much do you expect to get in next Tuesday?"

"Well, I don't know, but there are still six applications ahead of Mr. Jones." That was the last straw, and the weary collector wended his way down stairs, and pondered upon how that was going to pay for labor and coal by having to add a few dollars to it yet for a loan, which might be questionable assets. But that does not alter the fact that a set of laboring men must be paid, and being unable to realize upon that which is actually due to him, he turns to the only source left to him, of borrowing from his banker where he has perhaps already attained his safe limit and the banker, after listening to his pleadings of his pressing need on the one side, and meditating upon whether he will get his money back on the other, finally says: "Well, John, I don't know anything about brickmaking, but I guess I come ——— near owning a brickyard."

Instances without number like this might be cited, but no doubt each of you have had similar experiences, and it is therefore useless to weary you with more.

But you will say you have had this experience and paid for it, and will not let it occur again. Oh, no, not next year yet, for then you will still be riding the high horse of prosperity, and may be yet the year after. But it will not always be thus. These periodical times of depression will come along, and in order to make good collections these ought to begin by making good sales.

Custom has decreed that the manufacturer enters into a quasi-partnership with the contractor by being paid off in installments of 70 or 80 per cent of his goods delivered and upon the last payment is to await the total finishing and final settlement of the contractor and owner a long time after the brickmakers' goods are done with. An unjust partnership this, for the reason that it is of unequal proportions of merit and risk, and yet the brick manufacturers have helped to inaugurate this custom. There is no good reason why the manufacturer should be drawn in to assist the owner, to see that the contractor performs his part of the contract in which the manufacturer had no part in making, and therefore no good reason why the manufacturer should wait for his payment of goods after delivery.

But some will say you have the lien law. Yes, that is true, but the lien law is not an ideal of perfection, and then all business done where law and courts have to be invoked is unprofitable, and after each experience you will say that you would have been better off without that sale.

You as an organization have it in your power to remedy those evils by getting together and imbibing a little more of that modern religion according to the Apostle, St. J. Pierpont Morgan which seemingly leads us back to apostolic times by calling it "community of interests."

For after all is said and done, your whole business resolves

*Read at the 22d Convention of the Iowa Clayworkers' Association, Des Moines, Ia., Jan. 22, 1902.

itself into "How much money is there in it?" and after the trials and tribulations at the yard of refractory clay, imperfect machinery, unsatisfactory men, your thoughts instinctively turn to your office, and you wonder how this thing is going to turn out, whether there will be enough money coming in to pay everything and not least of all, whether you will have any yourself some day. You turn to your office man, who has tabulated the whole business, and he tells you all about it, for remember he has worked with his brain harder than any other man with his muscle for, while the latter pursues one particular routine of work laid out for him, the office man has to keep track of a hundred and one details, and make himself into the combination of salesman, credit man, collector and buyer, and no matter whether you make brick by stiff mud or dry press process, whether you burn in up or down draft kilns, the ultimate point in view is the money there is in it and your office man can tell you all about it, and a good office man is a valuable acquisition to a brick manufactory.

The Future Tile Business.*

BY H. F. ZARTMAN, SIOUX RAPIDS, IA.

We find nothing so uncertain in this world as dealing with the future. We always expect much and often get little. So in calculating the future of business, we must consider its past, and then we can arrive at some approximate conclusion.

The drain tile business was largely overdone in the years of 1894 to 1896, and then began a gradual increase in demand up to the present, when we have just closed one of the most successful years in the history of the drain tile or clay industry.

In comparing the statistics of the clay-working industries of the United States for the last six years, we find that the productions have increased from $64,865,385 in 1894, to $96,212,345 in 1900, while the drain tile productions decreased from $5,803,164 in 1894 to $3,026,213 in 1898, or from 8.99 per cent to 4.23 per cent of the total, and increased from $3,026,213 in 1898 to $5,842,562, or 6.58 per cent of total, in 1900.

We can see that the tile business is now better than has ever been known in the history of the country. I consider that there is a cause for every effect. The principal cause for the decrease from 1894 to 1898 was the continued low prices for grain following the panic of 1893; another, the dry seasons of 1894-5-6. I heard a number of the farmers and other men blaming the tile business for causing the dry weather, and some even predicted that this country would become a desert if tiling was continued; and one even blamed the low prices to the tile maker. There was little wonder for the decrease in the tile business.

Let us look a little further into the statistics. We find that the bottom of the tile productions was reached in the year 1896. Since then the United States statistics show an increase of $3,129,144; and Iowa shows up well in the revival, its increase being $153,498 up to the year 1901.

There was $225,650 worth of drain tile manufactured in 1896, and nearly 35 per cent of the firms reporting were idle; in 1897, $372,070, an increase of $140,420 and slightly more than 20 per cent; in 1898, $343,265—a slight decrease in tile, but an increase in clay products, there being 349 plants in operation—19 more than in 1897—and from being idle, there were undoubtedly a number of these plants that did not manufacture tile. In 1899 we find $377,586, or $34,361 over the production of 1898. An estimate would place the clay product 25 per cent above 1898. For 1900, $379,140, an increase of $1,560, with 381 plants reporting.

Thus you can see there has been a steady increase since 1896, and when the reports for 1901 are made, I think you will see a marked advance; more than ever before; for the memory of the past year is still in our minds, and never has there been so successful a year as 1901.

We sold all the tile we could make, and put forth every effort to turn out all we could. We got the best prices that we have since the decline of which I have spoken. And as we look into the future, can anyone deny that it seems to be a bright one for the tile manufacturer?

Land has increased in value from $35 to $60 an acre to $60 to $100 an acre, and this had made it plain to the farmers that it is unbusinesslike to have $60 to $75 land lying idle when it will be the best land they have when drained; and I think the Iowa farmers are looking at tile drainage from a different standpoint than they did a few years ago, for it was then hard to make some of them believe that it paid. With prices for grain and stock at the very top notch, it is possible for them to buy, and they can, with prices where they now are, afford to pay more for their tile; and if we do not get good prices for our tile now, we never will. When we get better prices, we can afford to make better tile, put in better machinery, and make more profit than we have been making.

Let us as an association, be more neighborly and work more in unison, and help each other, and keep up the prices, for I think we can still have better prices, and not make too large a profit. And when we meet together in 1903, we will bring in our report even better than that of 1901, the banner year for the tile maker.

*Read at the 22d Convention of the Iowa Clayworkers' Association, Des Moines, Ia., Jan. 22, 1902.

Drain Tile Chat.

It is interesting to watch the many uses to which drain tile is now being put and compare them with the stunted ideas as to its practical adaptability entertained some years ago. At Sioux City during this last summer the property owners on one or two streets where there were asphalt sidewalks, bored a hole about 3 ft. from each tree along the walk and sunk in this four or five 6-in. drain tile. All that was necessary then for watering the tree was to fill the drain tile with water and the roots of the trees absorbed from the ground beneath all the moisture that they required. The improvements in the appearance of the trees was marked and the process very effective. Another thing that we noticed was that beneath a large celery shed near Sioux City hollow blocks were embedded and these were also filled with water, the water being thus communicated to the plants beneath, instead of above. Perhaps the reader may have also noticed that on certain slopes of grass on terraces the verdure is very much more scant than at other points. One of the enterprising residents of Sioux City conceived the idea of laying 6-in. tile beneath the surface, where the grass was scant, and flooding these with water with the garden hose. This also proved similarly effective, as with the trees above mentioned. A luxuriant crop of grass was maintained throughout the season. Another resident employed similar methods for his lawn. In the center of his lawn he has sunk vertically a large drain tile from the bottom of which radiate, spoke-fashion, a number of small tile sunk about 8 or 9 in. below the surface of the ground. Instead of sprinkling the whole lawn with water, making it impossible for the children to play upon it or for anyone to walk upon it with comfort until the moisture has been absorbed and evaporated, all that he has to do is to flush all these tiles with water from the center feed. The grass derives all of its moisture then from the place where it is most needed, at the roots, and the surface of the lawn is always nice and fresh at any time of the day. The idea seems to be a most commendable and practicable one.

TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY

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Further Notes on the Tensile Strength of Clay Mixtures.

BY EDWARD ORTON, JR., E. M.

In Volume II of the proceedings of this society, pp. 100-125, an article was published by myself "On the relation between the tensile strength of clay mixtures and the size of grain of their non-plastic constituents," in which it was shown that in the experiments made, the tensile strength of the clay mixture varied inversely with the diameter of the grain of the sand, between the limits of .04 and .002 inch. But, another fact was also brought out, viz., that where a much finer sand was used, that a remarkable loss in strength occurred, which could only be explained on the assumption that the drying of the brickettes containing the fine sand had been too rapid, and had permitted cracks to be formed, by which the strength of the clay mixture had been reduced.

Obviously such a supposition requires demonstration before it can be accepted, and the following work was done to see whether we could show by further experiment that our hypothesis was correct.

Not having enough sand of the No. 6 size, the diameter of whose grains averaged 0.00017 inch, the first task was to make a sufficient supply. Frank H. Morrison, of Denver, Colorado, was set at this work, and he prepared about 15 pounds of sand by the same general system described in the previous article. There being no intermediate sizes required, he proceeded directly to his goal, first floating out a 3 minute sediment, from repeated quantities of the sand, and next sedimenting this 3 minute material and refloating it for periods of 20, 18, 16, 14, 12, 10, 10, 10 and 10 minutes respectively. Thus no particle was used which had not floated in relatively still water for 10 minutes and a large proportion of the sand had floated for much longer periods.

This slushy, impalpable material was then sedimented, collected in jars, treated with acid to remove metallic iron dust, of which there was considerable, even in this immensely fine pulp, then dried, screened to break up the caking formed by drying, and was measured by the microscope. The average diameter of the grains were 0.00024 inch. This is .00007 inch coarser than last year's No. 6. sand. Some of this difference is probably in the microscopic measurement, but the second batch of No. 6 sand was probably coarser than the first, as it was prepared by a shorter and more direct process.

The next step was to design a series of tests whose results should clear up the matter of this anomalous behavior of the clay mixtures containing very fine sand. Accordingly a large batch of the clay mixture, No. 6, containing 50 per cent Mayfield ball clay, and 50 per cent sand, No. 6, was prepared by blending in the slip state, evaporating to dryness with frequent stirring, pulverizing and screening the dried residuum, and tempering the screened powder to molding consistency with water and vigorous wedging.

This mass of clay was now made up into brickettes. The process of manufacture was in all respects the same as heretofore, and Mr. Morrison made every brickette with the most punctilious care.

The brickettes were divided as fast as made among five separate series, whose treatment in drying was varied as follows:

Series No. 1: Dried in the laboratory, at a temperature of 75° to 80° F., in the open, and without precautions of any sort. Time of drying, nominally six days, but they were really dry long before they were tested.

Series No. 2: Dried in the same room, but was covered with a heavy thick cloth which was quite damp when first applied and which became dry only after 36 or 48 hours. Even then, it shielded the damp brickettes beneath from air currents and delayed their drying somewhat. Time of drying, six days, at which point they were tested.

Series No. 3: Dried in a closed box, about 18 in. x 16 in. x 8 in. deep. The brickettes were placed in the box when quite fresh, and the lid was then nailed tight down and the air volume inside left to exchange its moisture with the outside air through the minute cracks in the box and pores of the wood. Time of drying, two weeks.

Series No. 4: These brickettes were placed in a box of the same dimensions, which had been previously washed, till the wood was well dampened. This box was then closed tightly, covered with a wet cloth and placed in a damp, cool place and left to dry out slowly. The wet cloth and damp box would certainly delay the beginning of the drying of the brickettes for a considerable period. The box was kept in underground cellar for about three weeks or possibly four, until the brickettes had become solid and practically ceased to shrink. The box was then placed in the coolest corner of the laboratory and after another period was finally opened and its contents tested after eight weeks drying.

Series 5: These brickettes were placed on shelves in an air-tight porcelain jar, provided with a lid which tightened down upon a rubber gasket by screw pressure. In the bottom of the jar was a mass of granular chloride of calcium, one of the most powerful dessicating salts obtainable. The brickettes did not touch the salt or come close to it. The lid being made tight, the jar was set in an underground vault and kept cool for eight weeks, during which time the moisture of the air in the jar was rapidly taken up by the salt, but the drying must have been very slow, since the heat for vaporization of the water still in the clay could only have been slowly furnished in this cool, dark place. Examination of the brickettes from week to week showed them to be slowly progressing; they could be dented with the finger after four weeks' drying. They were finally dried and tested at eight weeks, after having become perfectly solid and long past shrinkage.

Each series was finished by heating from three to seven hours in a hot air oven, at a temperature of from 120° to 130° C. This was done to expel hygroscopic moisture and to bring each series to a uniform condition. Mr. Morrison, who performed all the work so far described, found that the temperature at which the brickettes were finally broken was important; that a brickette was weaker at 100° C than at room temperature, or 30° C, and distinctly weaker if allowed to thoroughly cool and take up a little hygroscopic moisture again.

Series No. 4 and 5 showed a vesicular structure in a marked degree. The probable cause was organic fermentation or decay, which was favored by the long, quiet exposure to dampness. Three or four weeks certainly elapsed before any of these brickettes had become reasonably solid, and in this time these processes probably fed on the organic matter of clay and water and generated the minute gas cells which causes the porosity noticed in the resultant brickettes. Series 1, 2 and 3 did not show this structure at all, but were made from the same lump of clay at the same time.

The series were broken in exactly the same manner and on the same machine as was used in last year's work, with the following results:

Series No. 1. Dried without precautions.

Brickettes—1	188.41	5	192.51
" 2	118.78	6	172.03
" 3	159.74	7	184.32
" 4	204.80	8	155.64

Average—182.49 pounds per sq. in. Fluctuation, excluding No. 2, which contained a large flaw, was 26.9%.

Series No. 2. Dried under a cloth.

Brickettes—1	172.03	5	167.93
" 2	176.12	6	184.32
" 3	192.51	7	208.89
" 4	135.16	8	188.41

Average—178.17 pounds per sq. in. Fluctuation, 40.8%.

Series No. 3. Dried in a tight dry box.

Brickettes—1	188.41	5	188.41
" 2	192.51	6	159.74
" 3	143.36	7	163.84
" 4	172.03	8	200.74

Average—176.13. Fluctuation, 32.6%.

Series No. 4. Dried in wet box, in eight weeks.

Brickettes—1	114.68	5	221.18
" 2	172.07	6	225.28
" 3	184.32	7	221.18
" 4	217.08	8	192.51

Average, (rejecting No. 1, which was broken while too hot to handle, while all the others were permitted to cool down,) 204.80. Fluctuation, 26.0%.

Series No. 5. Dried over chloride of calcium, in cool spot, in eight weeks.

Brickettes—1	143.36	5	212.99
" 2	163.84	6	237.56
" 3	163.84	7	229.37
" 4	204.80	8	225.28

Rejecting No. 1, which was also broken hot, the average is 205.53. Fluctuation, 35.8%.

Collecting these results, we have

Series No. 1—Quickest, severest drying	182.49	pounds,	T. S.
" No. 2—Somewhat slower	178.17	"	"
" No. 3—Still slower	176.13	"	"
" No. 4—Very slow indeed	204.80	"	"
" No. 5—Artificial conditions	205.53	"	"

The maximum strength developed was 237.56 lb. per sq. in., by the last process.

Comparing these results with last year's figures on the brickettes of corresponding composition we find:

First. The lowest average of any of the five sets of brickettes is higher than the average of the brickettes made of coarser grained materials, viz.: 174.24 to 176.13. This proves that last year's work was abnormal, in some respect which cannot now be determined.

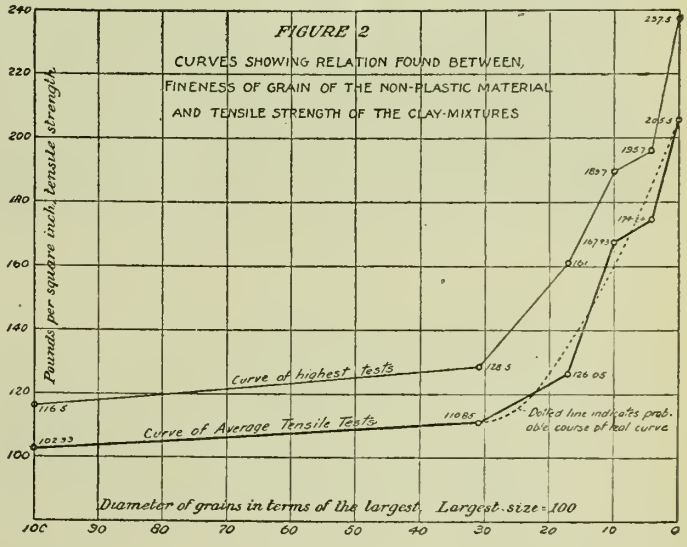
Second. The highest average of any of the five sets, which certainly cannot have developed any more perfect structure or greater tensile strength than the clay can be made to give in actual conditions, if the occasion justifies, is very materially above the last year tests on sand No. 5, viz.: 174.24 to 205.53. This tends to prove the assumption given, viz.: that faulty drying may materially alter the tensile strength of a clay brickette and that drying is therefore a feature which must be rigidly specified in any statement of methods of determining tensile strength, and must be rigidly observed by all workers who expect their results to bear comparison with others.

Third. Repeating for the sake of convenience the results of last year's series, as amended by the fuller knowledge of No. 6 gained by this year's tests, we have the following:

Number of Mixture	Av. of Diam. of Grains of Non-Plastic	Av. Tensile Strength
1	0.0364 inches	102.33
2	0.0114 "	110.85
3	0.0064 "	126.05
4	0.0038 "	167.43
5	0.0016 "	174.24
6	0.0002 "	205.53

The curve of last year, redrawn to show this new fact, is given herewith:

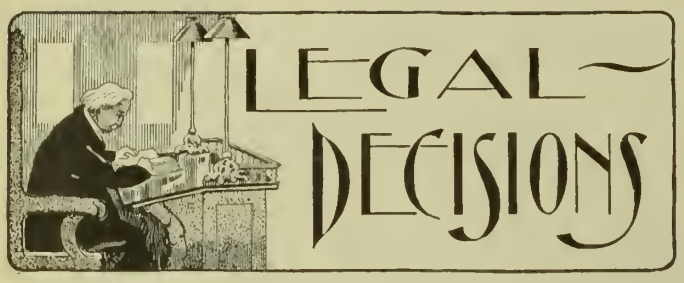
Fourth. We may now safely amend our general conclusion of last year as follows:



The logical deduction from all of the data here presented and so far obtained, is that the tensile strength of mixtures of a plastic ball clay, with equal quantities of non-plastic sands, will vary inversely with the diameter of the grains of the sand, from grains of 0.04 inch down to the finest sizes obtainable.

Fifth. Shorn of the obstacle of last year's work, and having now largely overcome the inconsistencies we then found, we may now believe, until it is shown to be untrue:

That the non-plastic ingredients of a clay influence its tensile strength inversely as the diameter of their grains, and fine grained clays will, other things being equal, possess the greatest tensile strength.



REVIVAL OF DEBT AFTER DISCHARGE IN BANKRUPTCY.

It is well settled, the supreme court of Minnesota says, that an oral promise is all that is necessary to revive a debt adjudged dead by bankruptcy proceedings. The form of language employed in such promise is not important, but it must be clear and unequivocal, and express a distinct intention to recognize payment of the debt. If a promise is coupled with any conditions as to time or ability to pay, the fulfillment of such conditions must be shown. In this case (Smith vs. Stanchfield, 87 Northwestern Reporter, 917), the maker of a promissory note agreed to pay the debt if the payee would give him time. In the absence of proof that the offer was accepted, and a definite time fixed, such offer, the court holds, did not justify a finding that the debt had been revived.

RIGHT OF PARTNER TO ACTION FOR MALICIOUS PROSECUTION.

An action to wind up a partnership on the ground of misconduct of a partner, and the deprivation of such partner, in such action, of his right to the possession and enjoyment of the partnership property, the supreme court of Wisconsin holds (Luby vs. Bennett, 87 Northwestern Reporter, 804), belongs to that class of actions that will sustain an action for malicious prosecution because of the injury to the good name and fame of such partner to an extent not remediable by a mere vindication of him upon the trial and a judgment for costs. Moreover, it interferes with his property to all intents and purposes the same as an attachment thereof would, and insuch a way that damages, other than those incident to an ordinary civil action maliciously prosecuted, are presumed.

DUTY OF EMPLOYE TO REPORT DANGEROUS INCOMPETENCY OF FELLOW SERVANTS.

It is the duty of an employe or servant, the United States circuit court of appeals holds (Weeks vs. Scharer, 111 Federal Reporter, 330), to report to his master, or to those whom the master empowers to hire and discharge his workmen, the dangerous incompetence of his fellows known to him, and notice of such incompetence and a failure to report it entails upon him an assumption of its risk.

VERIFICATION OF ACCOUNT FOR COLLECTION BY SUIT; BY BOOKKEEPER.

To furnish an easy and ready means of collecting accounts when no real defense exists, a Tennessee statute provides that an account on which an action is brought coming from another state or another county of that state with the affidavit of the plaintiff to its correctness, and the certificate of a notary public with his official seal annexed thereto, is conclusive against the party sought to be charged, unless he shall on oath deny the account. The oath of a bookkeeper, salesman or agent of any kind, the supreme court of Tennessee holds (Foster vs. Scott County, 65 Southwestern Reporter 22), is not sufficient. If the plaintiff cannot, for want of proper information, make the oath himself, he is not entitled to the benefit of the statute, but must prove his account as in other cases. As to the suggestion that, of course, the correctness of the account is naturally within the special knowledge of the bookkeeper, the court answers that it is more reasonable to assume that the bookkeeper makes no sales, is not personally cognizant of the sales made by the partners or their salesmen, and knows only that he is directed by them to make such entries and charges as they rport to him. He could only testify, perhaps, as to the correctness of his entries as reported by salesmen to him, and not as to the correctness of the items sold. When the suit is by a firm in which several partners are named as composing the same, the oath must be made by some one member thereof who is a plaintiff, and has the requisite information.

FALSE ASSERTIONS AND USE OF WORD "PATENT" IN TRADEMARKS.

A symbol or label claimed as a trademark, so constituted or worded as to make or contain a distinct assertion which is false, the supreme court of the United States holds (Holzapfel's Comp. Co. vs. Rahtjen's Amer. Comp. Co., 22 Supreme Court Reporter 6), will not be recognized, nor can any right to its exclusive use by maintained. No right to a trademark which includes the word "patent," and which describes the article as "patented," can arise when there is and has been no patent; nor is the claim a valid one for the other words used, where it is based upon their use in connection with that word. And when there has been a patent, which during its life justified calling the article a patented one, on the expiration of the patent, the right to use the word "patent" in the name or trademark thereof, the court holds, ceases, and there survives no exclusive right to even the remainder of the trademark or name of the article, the principle which prohibits the right to the exclusive use of a name descriptive of an article after the expiration of a patent covering its manufacture applying, as well as the doctrine above stated.

The McFeely-Wheeler Brick Co., of Pittsburg, has been recently organized and proposes to erect a brick plant at Latrobe, Pa. F. B. McFeely is president of the company.

The brickyards of J. W. Bynum, of Lake City, Fla., which regularly turn out 40,000 brick per day, have been enlarged by the addition of a new kiln with 150,000 brick capacity.

The Tygart Firebrick Co., of Greenup, Ky., is turning out 30,000 brick per day, and will double this output in the spring. The company has erected a large dry house, and has secured options on a tract of clay lands near Greenup.

The Monessen (Pa.) Brick, Tile & Terra Cotta Co's. new plant at East Charleroi, Pa., which was recently put in operation with a capacity of 35,000 brick per day, will run day and night indefinitely to fill the numerous large contracts which have been received. Harry Reinhart and Jack Menefee are the proprietors of this plant.

The proprietors of the McRoy Clay Works, Brazil, Ind., contemplate some important additions to the plant. Material is on the ground for the erection of three new kilns which will have an interior diameter of 35 ft. Steam power, which is at present used for the operation of the plant, will be replaced by electric power. Among other improvements, the drying tunnel is to be rebuilt.

The Wabash Clay Co.

The Wabash Clay Co., of Veedersburg, Ind., has one of the most important factories in the state. The plant is located on the Brazil branch of the Chicago & Eastern Illinois R. R., which affords abundant shipping facilities. The company also has access by switches to the Toledo, St. Louis & Western R. R. and the Peoria & Eastern. The grounds cover about nine acres, and the plant is situated about 4 ft. above Coal Creek, which runs a little to the southward. There are two buildings of frame with gravel roof, 65x100 ft. There are three iron stacks to these works. The clay is obtained from two separate pits, one a mile north, and one a mile south of the plant. It is a blue shale, but is not mined by the company, being supplied by contract. About one-half of the shale is hauled by teams to the plant and the rest is switched to the yards on the Chicago & Eastern Illinois. The clay is not weathered, but there are store sheds capable of holding 3000 tons of raw material. It is tempered in a horizontal pugmill supplied by the American Clay Working Machinery Co. The clay is worked in a stiff-mud condition. It is conveyed by belt and bucket elevators from the dry pans to the screen and by the same system from the screen to the pug mill. The machinery equipment comprises two single and one double Raymond represses, giving a capacity of about 50,000 brick every 10 hours.

Three kinds of drier cars are used, the "Iron Clad," Holbrook-Armstrong Iron Co., and Raymond cars. Two turn-tables are used, and the "Iron Clad" transfer cars are used in connection with them. The yard has also a very complete drying system, three driers being in operation, strongly built of frame and brick. One of them is an "Iron Clad" drier, and the others are steam and hot air driers of the company's own make. There are 18 tracks in all. The united capacity of the driers is 75,000 blocks (3¼x4x9). The time required for the drying ranges from 24 to 48 hours.

The plant is equipped with nineteen 26-ft. round down-draft kilns, and three oblong kilns. These average 28,000 capacity for each kiln. Coal is used as fuel, and between seven and eight days are required for the burning and drying of the kilns. Brick stacks, 50 ft. in height, give the necessary draft, four kilns being apportioned to each stack.

The sources of power are an Erie engine of 150 h. p. and two Erie and one Atlas boiler of 80 h. p. which carry 80 lb. pressure. Coal is also used as fuel in this department.

The products of the plant are the famous Poston paving block, a good wire-cut sidewalk brick and shapes for street car tracks, etc. The works were established in 1892. The plant is operated the whole year through. The officers of the company are R. D. Culver, president and general manager; I. G. Poston, secretary and treasurer, and T. S. Teuscher, vice president; Mr. Poston is also superintendent.

PLANT OF THE WABASH CLAY CO., VEEDERSBURG, IND.

A Few Suggestions Relative to Patents.

Wm. F. Hall, attorney at law, Equitable Bldg., 1003 F St., Washington, D. C., sends out a small booklet with this title, containing many useful suggestions to aspiring inventors. Especial emphasis is placed upon the necessity of the application for Letters Patents being prepared and prosecuted with the greatest care by one having a thorough understanding of the technical requirements, or otherwise the patents when granted may be practically worthless and may act, in fact, to invite competition into the field before controlled by the patentee. An inventor securing a good patent with properly drawn claims is in a position to dominate the field in which his invention belongs, and to effectually prevent the manufacture or sale of devices embodying the principles of the invention, notwithstanding slight changes or modifications that might be made by rivals in the hope of avoiding an infringement. The special advantages are possessed by Washington attorneys over others not so conveniently located to the patent office are pointed out.

To any one interested in this subject it would be of considerable benefit to apply to Mr. Hall for this little book, which may be had free on application.

The Coffeyville (Kan.) Vitrified Brick & Tile Co. has purchased the brick works at Chanute and will operate them in addition to its plants at Cherryvale and Independence. The Chanute property includes 170 acres of clay lands, a modern plant and three gas wells.

Bernerd & McGovern will start a brick yard at Clinton, Ia., in the spring.

The Mitchellville (Ia.) Brick & Tile Co. has put its new plant in operation.

Yeakle Bros., Waynesville, Ill., have finished burning a kiln of 40,000 brick.

The Abbeville (Ga.) Brick Works, which was recently burned, is being rebuilt.

J. W. McClelland, of Washington, Ia., will open new brickyards near Iola, Kan.

G. H. Stevens and S. Alexander projected a new brick works at Menomonie, Wis.

Mr. Altman, of Cheyenne, Wyom., is promoting a new brick plant at that city.

The Champlain Brick Co., of Mechanicsville, N. Y., is making repairs of its plant.

M. A. Thompson, Gastonia, N. C., is in the market for brick-making machinery.

An independent sewer pipe plant will be erected at Irondale, O., at a cost of $75,000.

Capitalists of Nashville, Tenn., contemplate opening a new brick works at Ardmore, I. T.

The Texas & Pacific Coal Co., of Thurber, Tex., is about to double the capacity of its brick works.

The St. Louis (Mo.) Vitrified & Firebrick Co. has increased its capitalization from $75,000 to $100,000.

J. J. Miller, of Benton Harbor, Mich., has purchased a half interest in the McCord brickyard at that city.

Fred W. Richart, Carbondale, Ill., is installing a complete equipment of machinery at his new pressed brick plant.

The Saginaw (Mich.) Clay Manufacturing Co. is preparing to remove its plant from Saginaw to Flushing in the spring.

The Fort Dodge (Ia.) Clay Works Co. has completed a new railway to convey the clay from the mines to the works.

The Garfield Firebrick Co., of Bolivar, Pa., recently installed a railway switch from its clay pits to the adjacent factory.

J. A. Ward, of Barberton, O., and W. W. McIntosh, of Akron, has secured options on extensive clay deposits near the latter city

A. W. Osborn and F. L. Galigher, proprietors of the Boulder, Col., shale brick works, contemplate erecting a new brick plant at Cheyenne, Wyo.

Valuable deposits of clay suitable for the manufacture of a superior hard porcelain have been discovered in the vicinity of Waco, Tex. Steps are being taken toward the development of these deposits, and will probably result in the establishment of pottery at Waco.

The Kirkham Art Tile Works, Barberton, O., will be rebuilt and operated with an increased capacity. The company is now in process of reorganization.

G. I. Turnley, of Cold Springs, Tex., has discovered valuable clay deposits on his property near that place and is desirous of erecting a pottery.

The Columbia Brick Co., of York City, Pa., will supply the Pennsylvania R. R. with 450,000 brick to be used in new construction work at Marysville.

The Simons Brick Co., of Los Angeles, Cal., has been awarded the contract for furnishing 1,400,000 brick for Potter & Co's. tourist hotel at Santa Barbara.

S. E. Weitzel projects a brick and tile plant at Gawrie, Ia. It is believed that a bonus of $2,000 will be raised by the citizens of Gawrie to aid the project.

The independent Sand, Gravel & Brick Co., of Chicago, has been incorporated with $25,000 capital stock by T. F. Monahan, R. J. Short and B. W. Kuetemeyer.

The Choctaw Pressed Brick Co. of South McAllister, I. T., has been incorporated with $50,000 capital stock. H. H. Keller and H. A. Townsend are interested.

Arrangements are now being made to open a brickyard at Imperial, Cal. It is claimed that a first-class quality of brick can be made from the soil at that place.

Gordon & Son, of Boise, Idaho, are now shipping brick to Payette. They have shipped 106,000 to Mr. Jaconson, who is building there and 28,000 to Ryan & Carr of the same place.

A 15-ft. vein of fine fireclay has been opened at Lock Haven, Pa., on lands owned by H. T. and W. I. Harvey, who are considering the erection of a new brick plant for its development.

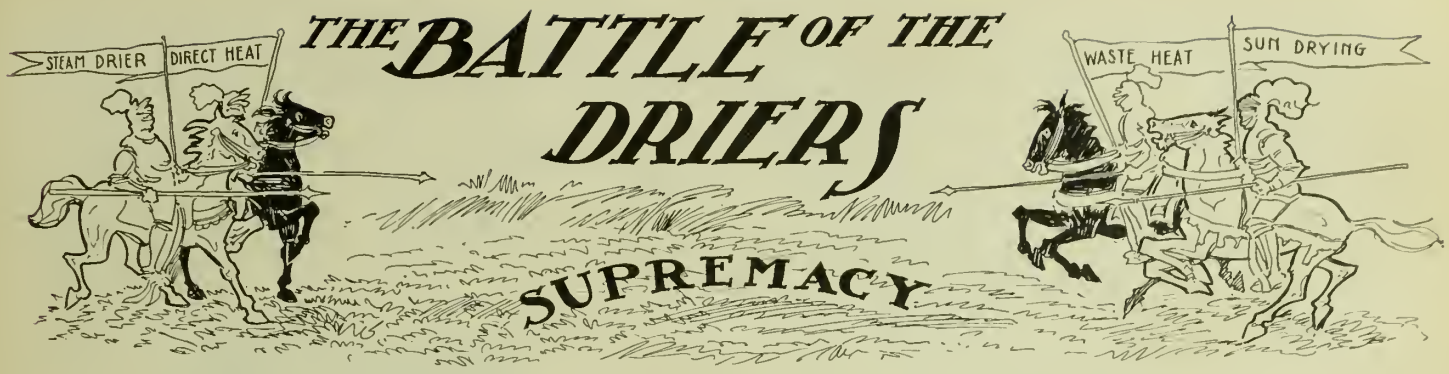
Ammorn & Co., of Galesburg, Ill., will install a pressed brick plant at Oklahoma City, I. T., in the spring. The plant is estimated to cost $40,000, and will employ 50 people at the start.

The managers of the pottery at Lincoln, Cal., have just finished sinking a shaft in their clay bed at that place, to ascertain the depth and nature of the deposit. The results of the investigation have not yet been given out.

F. W. Heidenreich, proprietor of the Hedrick (Ia.) Brick & Tile Works, has purchased an extensive tract of land containing fire clay and shale deposits at Iowa Falls, and will erect a pressed brick plant in the early spring.

The Trinidad (Col.) Press Brick Co. has started with a full force to run day and night until orders on hand for 4,000,000 brick shall be filled. The Trinidad company did a most prosperous business last season and its product is widely and favorably known.

A plant for the manufacture of brick from lime and sand is projected by capitalists of Colorado Springs. The lime added to the grade of pure silica is abundant in the vicinity, will it is claimed, produce a brick which will stand almost 100 per cent more pressure than other varieties of brick. If arrangements can be made for securing steam pressure and the saline solution, a plant will be erected at once.



Drying Clay Wares by Use of Suction Fan.*

BY O. T. DENISON, MASON CITY, IA.

One can hardly expect to offer you anything new on the subject of drying clay wares, but in these days when so many clay workers are experimenting with various methods of drying, it has occurred to me that an account of some experiments may be of interest to those who are contemplating work along this line, and possibly, thereby save them some costly experience.

That air, and not heat, does the drying, is axiomatic, but a fact often overlooked in installing clay drying apparatus. Heating the air simply increases the capacity of the air to carry water. Very cold air is usually much drier than warm air. After air has absorbed all the water it will carry at a certain temperature, drying of the clay ware ceases, unless other air is admitted, so that, as a general proposition, since heat costs money, the most economical drying is by use of constantly moving large volumes of air, moderately heated, if heated at all, and that heat obtained at smallest cost. The heat that ordinarily goes to waste, that of exhaust steam and that from cooling kilns, can be utilized for drying clay wares by use of a fan at the small cost of power to run the fans. We have found the suction fan more effectual than the force fan, since the suction fan, to a small extent lessens the density of the air, the same as heat does, and thus increases its carrying capacity, and whatever rarefying effect we get from the fan is at less cost than that obtained from fuel.

In proof of this statement I cite the fact that there is a perceptible falling of the barometer when taken to the drying room operated by suction fan, and a rising of the barometer when taken out again. We use a suction fan, 8 ft. in diameter, 5 ft. long on a 4-in. shaft, running 175 to 200 r. p. m. This fan with spokes 30 in. long, is set in brick housing with outlet into the outer air through a stack 5 ft. square, extending through the roof of the building, takes the air down through a coil of 1-in. pipes into which the exhaust steam enters through 6-in. headers; thence the heated air is drawn under ground in duct to the drying tunnels 100 ft. long; thence down into duct which leads to the center of the fan at each side; thence to the outer air. In summer the air enters the drying tunnels at 135 to 145 deg. Fahrenheit. In winter the air reaches the tunnels at about 100 deg., varying with the temperature of the outside air and with the speed of the fan. In cold weather the fan is run at a lower speed, since the aim is to run the fan at such speed only as will condense all the exhaust steam, and this speed will give the drier all the circulation needed for drying the wares in 24 hours.

The coils for the exhaust steam contain 15,000 lineal feet of 1-in. pipes in the two coils, the top consists of 5,000 ft. in 10-ft. lengths, in 40 lines leading from a 6-in. pipe header 14 ft. long, through return bends to a like header at the bottom of this coil. The bottom header is of the same construction, with 10,000 ft. of pipe, the inlets to each coil are connected with the main exhaust pipe, and the outlets are connected to a 4½-in. pipe which leads the water to filter through cinders, taking out the oil, thence the water falls into a cistern from which the boiler feed pumps or injector puts it back into the boilers as hot as it can be handled with pumps.

Just before the duct from the fan enters the drying rooms, a duct from the base of the kilns is connected with suitable dampers, to switch the suction of the fan from one kiln to another, and the fan takes the hot air from the cooling kiln, passing it into the drier, first mixing enough cold air with the hot to properly temper the air as it enters the drier. We have found in winter the strong draft required to take hot air downwards in the kilns and thence into the drier, brought into the drier about the doors considerable cold air, and we are now installing a 5-ft. fan in steel housing at a point between the kilns and the drier, this to act as a suction fan on the kilns and force the hot air into the drier, mixing the air which comes from the coil. This latter fan has water-cooled bearings, the fan being overhung, so that no matter how hot the fan and housing may become the bearings are cool.

By these methods we obtain all the heat from the exhaust steam, send it through the wares in the drier, mixed with all the heat from the cooling kilns that is needed, and at the same time get nearly all the water of the exhaust steam, put it back into the boilers hot, separated from the cylinder oil, which remains in the filtering cinders. All over Iowa the water available for boiler use carries very much of carbonate of lime, a cause of much waste of fuel and many "bagged" boilers.

Our experience teaches that the pipes in the coils should not be less than 4 in., center to center, as the air will not pass over and around the pipes rapidly enough to condense all the steam and thus absorb the heat.

The pipes should have not less than 2½ in. fall in each 10 ft. of run, for the rapid draining away of the water. We use by this method the exhaust steam from about 100 horse power of engines. We find this method of drying very economical, rapid, and satisfactory.

Large volumes of rapidly moving air at any temperature above freezing will dry clay wares as rapidly as is needful. I have seen a strong wind at 10 deg. below zero absorb ice one-eighth of an inch thick in one hour, no heat applied.

A back pressure valve is placed in the exhaust pipe to relieve the engines of back pressure, if from any cause it should arise.

Not less than 15,000 lineal feet of 1-in. pipe or 5,000 sq. ft. of radiating surface will condense 100 horse power exhaust in very warm weather.

The ducts from fan to drier are about 4x5 ft., of brick and all angles are made large to permit easy flow of air. Dampers are

*Read at the 22d Convention of the Iowa Clayworkers' Association, Des Moines, Ia., Jan. 22, 1902.

placed in the outlets of each drying room, to "shut out the circuit" any room not needed, as in case the ware is all dry or in case of too rapid drying and cracking of the wares. Closing of all the outlets of the tunnels renders the fan useless, or makes it no more effective than revolving of a pulley and very little power is then used.

The ducts from the kilns are of brick, arched wholly under ground, 2x2½ ft. in area, and out of the way of firemen.

It appears that the hot air of a cooling kiln will as readily pass downward inside a kiln as in a pipe leading from the crown down wards, outside the kiln. It requires strong suction of the fan in either case and air tight flues.

Economical Drying.

In order to be able to meet the keen competition which is found at the present time in nearly every line of business, the manufacturer finds it necessary to be constantly on the lookout for improvements by which he can reduce the cost of production, and he that sees and avails himself of such opportunities is naturally the one who is most successful. Therefore, the man who is engaged in the manufacture of any clay product cannot afford to overlook any chance of improving his methods of drying.

There are on the market numerous driers, but they can all be classed under four heads: Direct Heat, Direct Steam, Hot Blast Steam and Waste Heat Driers.

Direct heat driers are those in which the heat is obtained from furnaces directly connected with the drier, and in which either coal, coke or wood is burned to produce the heat. In order to obtain sufficient draft to produce good combustion, it is necessary to keep the escaping flue gases in the stack at a comparatively high temperature. The result is a considerable loss of heat, and this loss is unavoidable.

Direct steam driers are those in which the heat is obtained from steam coils placed either along the walls, under the floor, or both. Live steam is generally used in these coils, and if the capacity of the drier is very large, it necessitates a large boiler plant. Because of the large amount of radiation necessary, leaks in the coils occur frequently, and are, to say the least, very annoying. The cost of repairing these leaks is no small item in the cost of drying.

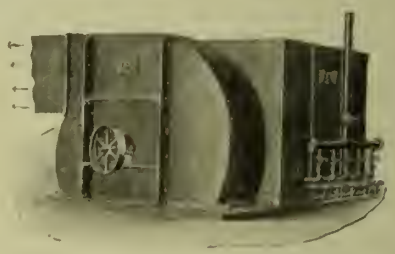
In both the above driers, the circulation is produced by natural draft. Everyone knows that the intensity of such draft is proportional to the difference in the weights of two columns of air, and this difference in weight is proportional to the difference in temperature, which is a very variable quantity. It can readily be seen that the draft, and consequently the circulation, in the drier is dependent upon the atmospheric conditions, and is very often insufficient to carry off the moisture.

In hot-blast steam-driers, the circulation is produced by means of a fan or blower. The air introduced into the drier is heated by a bank of steam coils, through which it is either forced or drawn by the fan. The circulation is dependent upon the speed of the fan alone. Naturally, in connection with this drier the question of the cost of power to operate the fan comes up. The fan is generally driven by a direct-attached steam engine, and as the exhaust steam is utilized in the heating coil, the cost of operating the fan is not so great as might at first be thought.

Where there is plenty of exhaust steam available, it is customary to use it in about three-fourths of the heater, the remainder using live steam in order to raise the temperature of the air to the required degree.

This drier is entirely independent of atmospheric conditions, and because of the possibility of utilizing exhaust steam in the heating coils, the cost of drying is much less than either a direct heat or a direct steam drier.

The last system brought out is the waste heat system, which is by far the most economical method of drying that has been, or is likely to be, introduced. Its adoption by any manufacturer of clay products is prevented only by the fact that it can be used only in connection with down-draft or continuous kilns. Some have an idea that it cannot be employed for drying any but the toughest clays. This is a mistake; if the drier is properly designed and operated, any clay which can be successfully dried in any drier, can



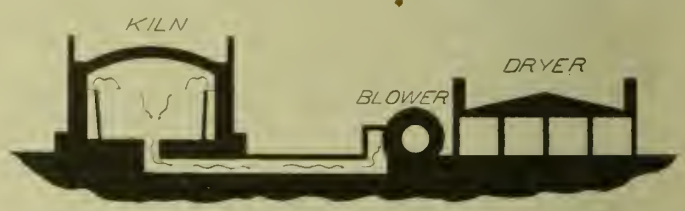
A. B. C. BLOWER.

be dried successfully in a waste heat drier. There are, of course, some clays in certain sections of the country, which cannot be dried in any drier, and which will check badly if subjected to wind or sun.

In the waste heat system the heat from the cooling kilns is made to do the drying. This is accomplished by drawing it from the kilns by means of an exhaust fan, which forces it into the drier. The heat which is utilized would otherwise be wasted, and by its utilization the cost of drying is reduce to a minimum, being practically the cost of operating the fan. This does not amount to more than twenty per cent. of the cost of drying by the hot blast steam system, and amounts to only about one per cent. of the cost of drying by either direct heat or direct steam.

Aside from the great saving in the cost of drying, there is considerable time saved in the cooling of the kilns after being burned; at the same time, the product is cooled more evenly, thus reducing the liability of checking.

It is impracticable, however, to draw heat from the kilns while in the process of burning, as it not only makes it impossible to



SECTION OF DRIER.

keep up the temperature in the kilns, but causes white-washing of the product in the drier by the sulphurous gases.

For drying bricks with this system, as with any other, a tunnel drier, operated on the "progressive" principle, is generally used, the green bricks being put in at one end of the drier on cars, and taken out at the other end, thoroughly dried.

The fan usually employed is a steel plate fan of the three-quarter housed type, having a bottom horizontal discharge, as shown in the accompanying cut. This fan discharges the heated air directly into the ducts underneath the drier. The blast wheel is generally overhung, so that neither journal comes in contact with the hot air. The journal box next to the fan housing should be water-jacketed to prevent overheating.

In the majority of cases the fan is operated by a direct-attached engine, the shaft of the fan wheel being directly atached to the crankshaft of the engine, making the apparatus very compact.

The temperature in the drier is controlled by mixing fresh air with the heated air coming from the kilns. Where plenty of waste heat is available, the temperature in the drier is limited only by the amount of heat the product will stand without injury.

The American Blower Co. of Detroit, Mich., may be termed the pioneer in the waste heat drier business, as it was the first to introduce a drier in which waste heat could be successfully utilized for drying clay products. Since its introduction the "A B C" waste heat drier has given universal satisfaction, and has been used for drying every clay product which can be dried in any drier.

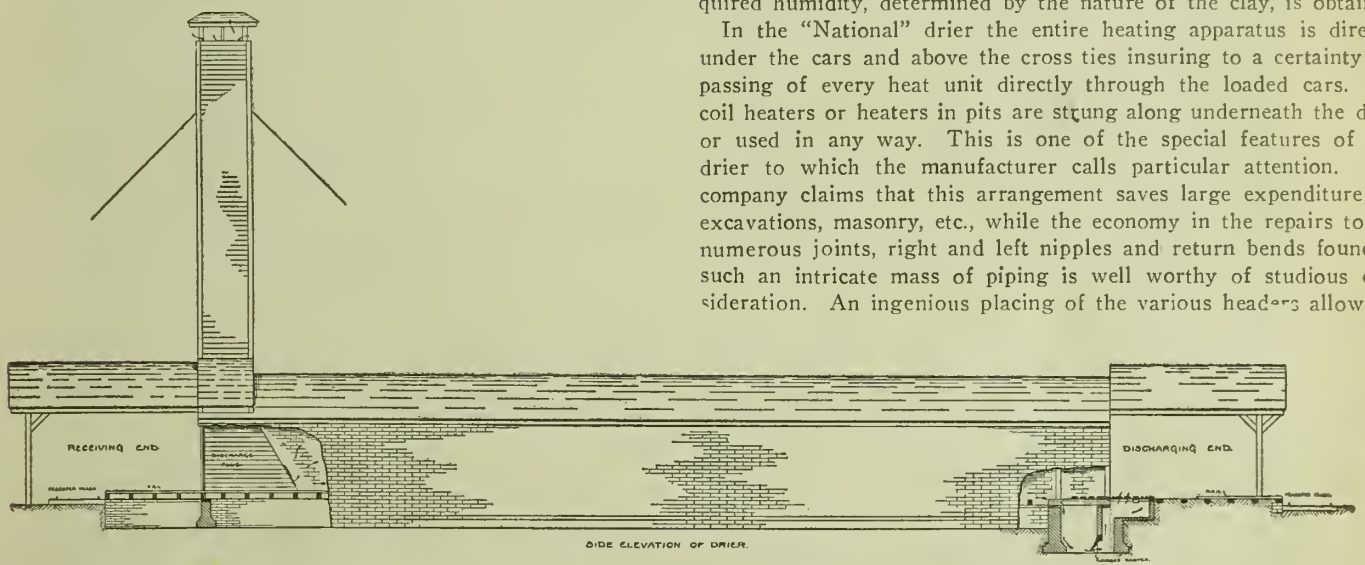
A New Brick Drier.

The National Dry Kiln Co., manufacturer of brick and tile driers, 33 West South St., Indianapolis, is placing before the public a drier of the most approved type. The "National" drier is 116 ft. long and it can be planned to suit special yard conditions and equipments. The tracks are composed of steel rails spiked to the cross ties and the usual grade is allowed to facilitate the moving of the loaded cars. Ordinarily the tracks extend 10 ft. on the platforms at the receiving end and 25 ft. on the platforms at the discharge end, while each main track will hold 16 cars of a capacity from 430 to 606 brick according to the kind of brick and the style of car. The number of tracks, of course, is governed by the size of the plant and the holding capacity of the drier. The time occupied in drying is from 24 to 48 hours according to the nature of the clay and the kind of machine used, and it is claimed that all kinds of clay products can be dried in a most satisfactory manner with a minimum expenditure of fuel. The circulation and ventilation of the drier is maintained as follows:

Air is admitted to the drier through the slatted floor with dampers at the discharging end. Before reaching the drier proper, it comes in contact with the drain headers, drain tank and expansion pipes which in other driers are placed in pits outside of the building and the radiation lost. This radiation is used to warm the air before it reaches the heating surface. A discharge flue is located at the receiving end and sliding dampers lead into the discharge flue. Circulation is thus kept under perfect control and the required humidity, determined by the nature of the clay, is obtained.

In the "National" drier the entire heating apparatus is directly under the cars and above the cross ties insuring to a certainty the passing of every heat unit directly through the loaded cars. No coil heaters or heaters in pits are strung along underneath the drier or used in any way. This is one of the special features of this drier to which the manufacturer calls particular attention. The company claims that this arrangement saves large expenditure for excavations, masonry, etc., while the economy in the repairs to the numerous joints, right and left nipples and return bends found in such an intricate mass of piping is well worthy of studious consideration. An ingenious placing of the various headers allows of heating with varying intensity and speed according to the capacity of the clay.

All the pipes discharge towards the discharging end and drain by



SIDE ELEVATION OF DRIER.

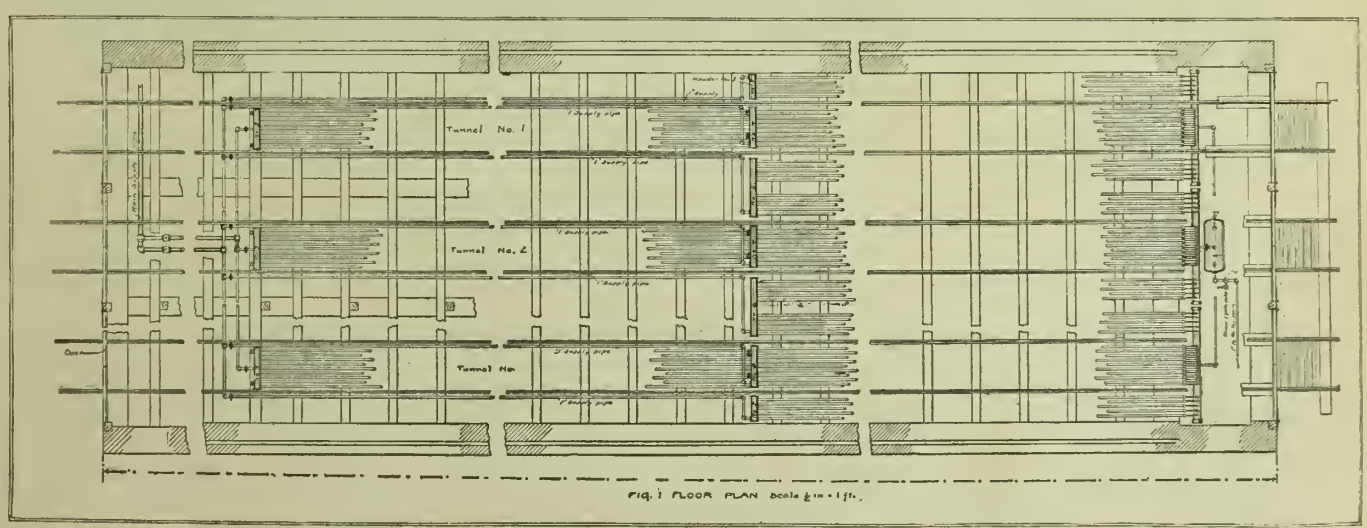


FIG. 1 FLOOR PLAN Scale ⅛ in. = 1 ft.

gravity. The entire system drains into a drain tank and from thence to the boiler room where it is returned to the boiler by a steam pump or automatic return trap.

The National Dry Kiln Co. claims that it has overcome one of the great drawbacks to the utilization of steam for drying purposes as now commonly applied in that the heating of the drier by box coils, a very complicated arrangement frequently to be repaired and generally inaccessible, is done away with.

(To be continued.

A Novel Hotel Construction.

One of the latest ideas in hotel construction is now materializing at West Baden, Ind., which, as most of our readers are perhaps aware is a popular health resort on the line of the Monon railway. The new building is a multi-sided structure with an oval-shaped court which will be crowned by a glass dome 200 ft. in diameter. The building will be six stories in height, will contain 500 rooms and its dimensions on the ground are 634x343 it. One of the most interesting features of the construction is that the rooms in the hotel will all be square or oblong and of regular form. This is accomplished by utilizing the wedge-shaped spaces resulting from the circular form for bath rooms, closets and wash bowls. This will give great convenience in furnishing and laying carpets, the rooms all being very symmetrical. The hotel clerk will presumably have no difficulty in giving every guest the best room in the house as all will be equally lighted and similar in convenience.

The photograph from which the accompanying illustration was made, and for the use of which we are indebted to the courtesy of the Hotel World, was taken when 500 men were at work in the building. The hotel is to be entirely fire-proof and is on the site of the hotel which was burned last year. The plans were drawn by Harrison Albright, architect, of Charleston, W. Va.

THE NEW HOTEL AT WEST BADEN, IND.

The Columbus (O.) Brick & Terra Co. has elected the following officers: L. G. Kilbourne, president, general manager and treasurer; F. A. Jacobs, vice-president, and Charles F. Hinds, secretary.

Vitrified brick manufacturers of Coffeyville, Kan., will furnish 3,000,000 brick to be used in the erection of new buildings at Fort Leavenworth. Three hundred cars will be required to haul the consignment.

The Glens Falls (N. Y.) Terra Cotta & Brick Co., of which J. M. Coolidge was president, was dissolved by vote of its stockholders, February 4th. The company was organized in 1885 with a capital stock of $45,000 and conducted a prosperous business until 1896 from which time business has declined until it was decided that the operation of the plant was no longer profitable.

The United States Fireproofing Corporation which was recently organized under the laws of New Jersey to take over clay manufacturing plants in several southern states, has elected the following officers: Charles K. Robinson, of New York, president; William Lanier, formerly of Washington, now of New York, vice-president; H. M. Lundis, cashier of the Tradesmen's National Bank, of Pittsburg, treasurer, and Byron Traver, of New York, secretary.

Wisconsin Clayworkers' Association.

Proceedings of the Second Annual Convention, Held at the St. Charles Hotel, Milwaukee, Jan. 28-30, 1902.

The convention was called to order at 2 p. m., January 28th, by the president, E. W. Drake, who introduced the mayor of Milwaukee, David S. Rose. Mayor Rose made an interesting address on Milwaukee's resources and welcomed the association in the name of the city. He was followed by Henry Herman, of Milwaukee, who extended a welcome on behalf of the brickmakers of the city.

The president then introduced C. S. Morris, of Berlin, who made a most felicitous response to the dual invitation.

The president then referred to the debt which the association owed to its secretary, Dr. E. R. Buckley, for his work of organizing the Wisconsin clayworkers. Dr. Buckley then read the

SECRETARY'S REPORT.

Pursuant to a call issued by thirty of the Wisconsin manufacturers, the first annual meeting of the Wisconsin Clay Workers Association was held in the Capitol Building at Madison, Wis., Feb. 5 and 6, 1901. On the first day a temporary organization was perfected with David Stephens, of Madison, as president, and E. R. Buckley, of Madison, as secretry. Committees on Constitution and By-Laws, and on Resolutions were immediately appointed for the purpose of making a permanent organization.

The sessions were very largely devoted to the reading of papers and discussion of topics of interest to the trade. A banquet was held on the first evening and during the afternoon of the second day the visitors were escorted through the University buildings. During the last session, constitution and by-laws were submitted and approved. Officers were elected and the invitation of the Milwaukee brick manufacturers to meet in Milwaukee in 1902, was unanimously accepted.

The association ordered the secretary to have the proceedings printed and distributed to the members. This has been done. The proceedings have also been placed in the hands of all the other brick manufacturers in Wisconsin.

The attendance at this meeting was far beyond the anticipations of those who were fostering the organization. The attendance was in the neighborhood of 50, and of this number 40 were enrolled as members. Six names have since been added to the list, all of whom have been enrolled as charter members. The total active membership of the association is now 46. It is thought that during the coming year the membership ought to be doubled and I confidently look forward to a time when it will exceed the one hundred mark.

The secretary has endeavored to perform all of the duties ordinarily devolving upon such officer. Owing to the fact that he was called upon to change his residence from Wisconsin to Missouri this has been at times attended with difficulty. I wish at this time to say that our president, E. W. Drake, has proven himself to be a most efficient executive officer and whatever success may attend this meeting is largely the result of his labors with those of his Milwaukee associates.

I believe that it should be the duty of the secretary not only to keep a record of the meetings and to perform such clerical work as may be necessary in the transaction of the business of the association, but that he should also keep himself in touch with all the brick manufacturers throughout the state. With this end in view, I would recommend that he be instructed to keep a careful record of the names of all brick manufacturers, the foremen, superintendents and every other person in any way connected with the clayworking industries. It ought to be the duty of each member of the association to inform the secretary of any new manufactories which come to his notice during the year. By keeping such a record it may be possible eventually to reach a solution of some of the labor and other difficulties experienced in the brick manufacturing business.

I am very anxious that this should be made a part of the duty of the secretary and trust that some action may be taken at this meeting incorporating this in the by-laws.

During the year I have received $90.00 as initiation fees from members. This amount has been turned over to the treasurer and I submit with this report two receipts covering the same.

I wish at this time to extend to the clayworkers of Wisconsin my warmest thanks for the many courtesies which they have shown me during my connection with the Geological Survey of Wisconsin. I trust that they will continue to assist any and all members of the Geological Survey who may take up the problems which I have left unfinished. There are many problems connected with the clayworking industries of Wisconsin which should be given the careful consideration of some one who can devote his time to experimental work.

The President: We will now take up the subject which we marked for 4:30, "Tile Drainage," by C. G.. Elliott.

Mr. Elliott being ill, his paper was read by the secretary as follows:

TILE DRAINAGE FOR WISCONSIN.

By C. G. Elliott, C. E., Indianapolis, Ind., Editor "The Drainage Journal."

Wisconsin has large areas of land which await only the advent of the skilled drainer and the product of the tilemaker's kilns to equal or surpass her sister states in the production of the valuable cereals. You of Wisconsin have no occasion to look toward the arid regions of the west for an expansion of the farming domain, nor to concern yourselves personally in the irrigation of regions deficient in rainfall, while you have acres upon acres of land within your own boundaries which are waste because too well watered, but which can be easily reclaimed, and other acres whose production can easily be doubled by carrying out well considered and practical plans of land drainage.

Wisconsin has before her the example of neighboring states whose experience in drainage work constitute a valuable lesson manual, which when carefully studied, will serve to prevent many of the mistakes that always accompany the beginnings of projects. She enjoys the distinction of possessing business enterprise and natural resources necessary to accomplish her undertakings. It may be assumed that her people are ready to enter into any project and engage in any business which will develop the natural wealth of her lands, and thereby add to the reputation which the state enjoys for thrift and material stability. Permit me as a resident of another state, but familiar with land drainage practice and its value to agriculture, to call your attention to this subject so closely allied with progressive soil culture.

Drainage and Good Husbandry Go Together.

The theory and practice of drainage are better understood now than they were fifteen years ago. The results are better known; the influence of the improvement is more salutary and far-reaching than the most sanguine at that time expected to see. That

the best farming practice and underdrainage are closely identified with each other where success in the culture of clay soils and subsoils has been attained is now conceded. The trenching and laying of drains in such soils makes good culture possible and the latent fertility of the soil available. You may ask why this is so, and it is a proper question. A fact may be known, but not always fully appreciated. Drainage may be recognized by a man in the abstract, but not so thoroughly believed in that he will at once undertake the work on his own land and profit by the results. It may be the proper course for others, but for him it is not so clear. The facts do not come to him with sufficient force to impress him with their peculiar value in his case.

Among my earliest recollections of work on an Illinois farm are those connected with the making of small field ditches for the purpose of removing the superabundance of water from the cultivated land. My father, who was a firm believer in drainage, and practiced it as far as his opportunities permitted, remarked at one time as we contemplated the ditches, "I suppose it is a fact that in some part of the East they lay earthen pipes underground, and in that way dry land like this; that where we are digging these field ditches, their plan would be to open them deeper, lay drain-tiles, and cover them." This was about the time of the extension of underdrainage in western New York and Ohio, and in his reading he had learned the facts. To both of us they seemed more like legends of the far East than something to be investigated with reference to their practical value. So we continued to dig in the old way until in the course of events the subject of underdrainage was brought home to us and later its value demonstrated by practice. A man must be so thoroughly imbued with the value of the improvement that he will order tile and pay for them, and see that they are placed where they will do the most good, or he need not expect to get any practical good from his belief. It is the general who puts his tactics in practice on the field who wins the battle; not the one who sits in his tent and reads how battles have been won. It is the land owner who has the nerve and courage to follow up his knowledge and convictions on the drainage subject who will grow tall wheat, fat cattle and great corn and grass.

Why Is Soil Drainage Valuable.

Scientific investigation in late years has thrown much new light upon the properties of soils, and pointed out more clearly than ever before the means which may be used for their improvement. Practical results have not been lacking to sustain these findings, yet I am compelled to say that by many these matters have not received the attention which their importance demands.

The first difference apparent between a dry and a wet soil is its firmness. The particles of soil are effectually separated from each other when the soil is saturated. Fifty per cent. or more of its entire volume may be water, which occupies the inter-spaces, and under such conditions no loads can be moved over its surface, nor is cultivation or growth of crops possible. Reduce the quantity of water to 25 or 15 per cent, and the particles of soil come in contact with each other at points; air fills the space previously occupied by water, and the soil is mechanically changed. If the soil water be drawn to a depth of three or four feet, the space in the volume of soil will be occupied by moisture and air in the proportion of from 8 to 23 per cent of the former and from 25 to 40 per cent of the latter. The additional thrift and growth of plants on soils on which these simple changes were made seemed greater than ought to be expected: that is, the cause was not adequate to produce such results. It is now known that with the air which enters the soil a certain kind of bacteria is present, which, under these favorable conditions converts the organic matter of the soil into nitric acid, one of the chief nitrogen supplies of vegetation, thus supplying this important plant food direct and making otherwise inert soil matter available to plants. The action of the air has a disintegrating effect upon the matter of the soil, while water tends to preserve it unchanged. The rainfall percolates through it to the drains, and from it is filtered the organic matter it contains. The frosts in our northern climates penetrate deeper where water is absent and do much toward fining the old and making new soil. All of these conditions are brought about by underdrainage, and, contrawise, such changes and advantages do not appear in soils having no drainage.

A few facts further: The temperature of a wet soil is kept down in the spring until the heat of the sun warms the water or dispels it by evaporation. No germination of seeds or growth of plants will take place in the spring until the soil reaches a temperature of from 48 degrees to 72 degrees F. According to experiments made by Professor King, the amount of heat which will raise a given amount of water 10 degrees F. will raise an equal weight of dry clay 44 degrees. Wet soils must therefore warm more slowly in the sun, because the water which they contain tends to hold the temperature down. The more intense cooling process, however, takes place through the evaporation of water from the surface. The week or ten days' additional time which it will take a wet soil to become sufficiently warmed in the spring for the ready starting of plants is no small disadvantage to the farmer in the Wisconsin latitude. Good drainage, if it accomplished no more, would often mark the difference between profit and mere existence to the Wisconsin farmer. The necessity of securing a proper temperature for the soil is emphasized by the careful work of a noted experimenter, who found that the germination of wheat, rye, oats and flax goes forward most rapidly at 77 degrees to 88 degrees F. He found that when corn would germinate in three days at a temperature of 65 degrees F., it required 11 days when the temperature of the soil was as low as 51 degrees F. He found, further, that when oats would germinate in two days under a temperature of 65 degrees, it required seven days to do the same work under a temperature of 41 degrees.

As a further advantage which should be mentioned in this connection, it has been found that the germs which develop nitric acid from humus, cease to develop when the temperature falls below 41 degrees; that their action is only appreciable at 54 degrees and becomes most vigorous at 98 degrees. Nothing has been found so efficient in increasing the temperature of the soil as drainage by tile, and I may add that the advantage is of paramount importance in northern climates, where longer growing seasons are a great desideratum. The changing and perfecting of the soil as deep as the drains are laid, making a depth of three or four feet of soil available to plant roots, instead of one or two feet, making possible the continual development of plant food; the increased storage capacity for moisture, to tide over seasons of drought, are all but suggestive of the important benefits which accrue from the improvement under discussion.

The practice of the art is not difficult, though there are well-defined principles which must be followed. Clays for the manufacture of the necessary tile are conveniently distributed by Nature in your state. The profits accruing from such work are so well assured by examples found elsewhere, that it is devoid of all speculative uncertainties. Should the tile manufacturer be pushing enough to urge upon you the sale of his ware, you may think that he is doing it in self-interest, if you please, but rest assured that the history of this phase of the clay business teaches that this is one of the instances where the purchaser usually receives a greater profit than the seller. Many can apply the trite saying of Caesar, "I came, I saw, I conquered," to themselves, in the inception and development of their drainage projects.

I have but dropped a few pertinent hints and admonitions in this brief paper, and take occasion in closing to assure you that the subject to which I have called your attention is a most attrac-

tive one from every standpoint, and that tile drainage of land offers to the agriculturists of Wisconsin greater profits than anything in which they can now engage.

The president then extended an invitation to all non-members present to join the association, and the meeting adjourned till Wednesday morning at 9:30 a. m.

Second Session.

January 29, 1902, 10 A. M.

After announcements concerning entertainments were made by the president, the secretary read the report of the treasurer, William E. Finnegan, which showed:

Receipts.

From initiation fees	$90.00

Expenditures

Paid T. A. Randall, printing reports	$18.50	
Express on reports, Indianapolis to Madison	1.60	
Express on reports to Green Bay	.90	
Postage mailing reports to non-members	2.60	
Expense of secretary for stamps, envelopes, record books, printing, etc., as per report	18.57	42.17
Balance in treasury		$47.53

The report of the treasurer was approved.

The secretary then read two proposed amendments to the By-Laws, which, after some discussion, were laid over till the afternoon session.

The President: On Thursday you will find that at 10:15 we have a question box. I do not know that we have received any questions as yet. If any of you gentlemen have questions to ask which will not come into the general discussion or that may not be otherwise discussed or answered—anything that you want to know in regard to clay working—just write it out and give it to our secretary, and it will be answered, wisely or otherwisely, before the convention is over. The first paper upon our program is by Mr. F. L. Sanborn, of Portage, "Our Experience in the Manufacture of Soft Mud Brick." (This was printed in "Brick" for February, page 111.)

Discussion on Mr. Sanborn's Paper.

Mr. Youngren: I would ask the gentleman whether his brick swell any during burning or just before they get the heat on them.

Mr. Sanborn: They do, probably; we have to be very careful. Years ago we overheated a kiln and it would not burn—stopped it up entirely. We burned it 14 days. We have to be very careful not to get it too hot before getting the water smoke out. It takes about five days to get it thoroughly dry.

Mr. Youngren: What I want to find out is whether or not the brick swell before the water smoke was off. I judged from what I heard it was a limey clay. I would like to know whether or not it has the peculiarity of swelling under certain conditions after the water smoke is off.

Mr. Sanborn: I don't think they do after the water smoke is off. I think they swell during the taking off of the water smoke; just before the top of the kiln is thoroughly dry.

Mr. Hinkley: If no one else has any question to ask, I would like to ask one, though not perhaps directly in the line of Mr. Sanborn's paper. In the last number of "Brick" I noticed a communication on the mixing of coal dust with clay while the brick are being made. I would like to ask if any gentleman here has had any experience with this process and can give any additional information in regard to it. I would like to know whether or not it is of benefit.

Mr. Sanborn: We tried that years ago, but we didn't see that we derived any benefit from it whatever. We mixed coal screenings with the clay before it was molded, and then we poured it in the openings around the heads, down into the kiln. Our experience went to show that the coal was burned out and was gone before the brick were hot enough for it to do them any good. But I think at the same time Watertown was using coal screenings and claimed they were a benefit, but this was not our experience.

Mr. Randall: I remember an amusing incident that occurred at the National Association some years ago regarding this mixing of coal dust with clay. An old, experienced brickmaker thought he would go home and try it. He didn't ask what kind of coal was mixed with the clay, so used soft coal, with the result that the brick all swelled up and spoiled. He came to the next convention and roared that it was a mistake, but when it leaked out that he had used soft coal, they ridiculed him severely about it.

Along the Hudson river they do this all the time. A certain part of the common building brick are "coalers," as they call them. They mix about 5 per cent of coal screenings with a certain per cent of their brick, and this they put in alongside their kilns, where they have the most trouble to burn hard brick. This is done universally along the Hudson river, and I think that in Chicago "coalers" are used all the time. I guess that in almost all the common brick coal screenings are mixed with the clay before the brick are formed, and those brick burn easier.

The President: There are plenty of gentlemen here who have been using coal screenings, and let us hear from some of you. Tell us whether or not you have found it beneficial.

Mr. Finnegan: At the yard which Mr. Hinkley is working now I used coal dust for years, and the only difficulty I had was when they put in too much and when they didn't put in enough. It was hard to determine whether it was a benefit or not. Where they put in too much, it made the brick shaky; that is, the coal got afire before the moisture was all gone. Unless you can get the coal for almost nothing, I think you had better let it alone.

The President: That is what we did in Milwaukee—when we got it for nothing we used it; when they charged for it we quit it.

C. G. Stoll: I will say that in Chicago they are using coal dust in nearly all of their factories. They use three shovelsful for each carload of clay that comes from the bank. For the round heads and sides of the kiln they use five dirt shovelsful. They use hard coal screenings altogether.

The President: That is, one of their little dump-carts, you mean?

Mr. Stoll: Yes.

G. J. Schwarz: For the information of the gentlemen present, I would say regarding the cost of this coal dust, the Chicago people all use anthracite screenings and the cost at the yard is $1.55 a ton. It will vary 5 or 10 cents a ton from time to time, but it runs from $1.25 to $1.55 per ton.

C. S. Morris: I would like to ask Mr. Sanborn if he knows about what proportion of his brick are sand. I have used many of those brick and I look upon them as one of the best weather and sewer brick that are manufactured in Wisconsin; and I think there must be quite a large proportion of sand. They are certainly made of material that is adapted to this climate. Have you any idea, Mr. Sanborn, about what proportion of your clay is sand?

Mr. Sanborn: No, sir, I have not. As I said before, it lays in the bank and they cave it down and mix it. Of course, there are some parts of the bank that are richer than others; and we have to mix it occasionally; but as a general thing, the bank can be used from top to bottom. I would say that there is a peculiarity about those brick; the longer they stand exposed to the weather, the harder they grow. I know years ago I had occasion to veneer

an office building, and for the purpose I took off what we term the pipe faucet on the top of the kiln, and they were very tender; we could not ship them and never pretended to. We only use them occasionally about town. I used those brick for veneering that office building, and in ten or fifteen years I had occasion to move the building and I pulled off the brick and found them as hard as flint. That is our experience with soft brick. If placed above the ground and exposed to the weather they will grow hard. However, I don't know just the proportion of sand and clay.

The President: The next paper on the program will be:

"THE MINIMUM COST OF BURNING CREAM COLORED BRICK FROM WISCONSIN CALCIUM CLAYS, AND HOW IT CAN BE ACCOMPLISHED."

By P. L. Youngren, Milwaukee.

Under the distinctive name of calcium clays we generally class all clays in which the carbonate of calcium, or the double carbonate of calcium and magnesium enters as predominant or characteristic ingredients, constituting the principal fluxing ingredients and imparting to the burnt product a light yellow or cream color.

The presence of these carbonates in the clay is desirable within certain limits—when they exist in sufficient quantity only to form, when reduced to oxides, the necessary flux for the other clay ingredients. However, when they reach such proportions that they constitute from 40 to 50 per cent of the clay, they become dangerous factors in the ordinary way of burning in a kiln with an oxidizing atmosphere.

By the old method of burning in use here in Milwaukee, a splendid building brick is produced from material of this composition, but it has been accomplished at a very great expense, the length of time required and the amount of fuel necessary to burn a kiln being almost beyond the comprehension of those who have not had actual experience with it. It is by no means due to lack of enterprise that this system has been continued in use, as many different and approved styles of kilns and methods of burning have been tried from time to time, but without success, and, until recently, it has been found necessary to revert to the old system.

This system consists in part in maintaining, during the burning stage, a neutral or reducing atmosphere. This is an atmosphere in which there is no free oxygen present, and is necessarily imperfect combustion, as in practice there can be no perfect combustion without the oxygen being present in considerable excess of what is actually required to form a combination with the fuel.

Imperfect combustion is, of course, not productive of a great amount of heat, and accounts in some measure for the length of time required to burn a kiln, the average of which is about 16 days.

The exact chemical reactions taking place between the various elements of the clay during the burning, and the manner in which the kiln atmosphere influences these reactions has not, as far as my information goes, been satisfactorily explained. It appears that everybody concerned has been contented with knowing what conditions are necessary to produce the desired results, without going deeply into the whys and wherefores. I regret that it is but recently that I have taken up this matter seriously—too recently to have arrived as yet at any definite results. However, I take this opportunity to express my views on the subject, hoping to draw forth some instructive discussion of the principles involved.

If we observe the behavior of this clay under fire, under different conditions of kiln atmosphere, we are soon led to the conclusion that the composition of the kiln gases has a very decided influence on the reactions during the calcining, as well as during the vitrifying period

When the operation is carried on in an oxidizing atmosphere, which facilitates the decomposition of the carbonates, we find that the brick will commence to expand or swell just before visible red heat is reached, and continue to swell until the calcining stage is completed.

After the brick is thus freed from the carbonic acid gas it will stand up under what would ordinarily be termed a good white heat without any apparent change taking place, regardless of how long that heat is continued. The brick at this stage will be found to have increased about 5 per cent in lineal measurement, as compared with the original brick, and has decreased from 15 to 20 per cent in weight. At this stage the brick is therefore very porous and appears to be only baked together. If the temperature is increased by degrees until the fusing point of the calcium oxide is reached, reaction takes place very suddenly and quite vigorously, and as there are not, at that temperature, any refractory ingredients present in the brick to hold up its structure, it will crush and warp, in addition to undergoing an immense shrinkage in volume, and under a little further increase of the temperature it will collapse into a shapeless mass.

When, on the other hand, the brick is burned in a neutral or somewhat reducing atmosphere, which retards the dissociation of the carbonate, there will be formed but very little, if any, expansion or swelling during the calcining stage; the brick will fuse and solidify gradually, with very little, if any, shrinkage, and at a considerably lower temperature than what was necessary to cause fusion of the swelled brick mentioned above.

An example in support of my assertion that the burning of this clay is not a simple question of temperature will be seen if we place the bricks close together in the kiln in such manner that the kiln gases cannot come in contact with the surfaces of the brick except at its ends. This prevents a free escape of the carbonic acid gas from the central portion of the brick. If the brick are now burned in an oxidizing fire and the heat raised as quickly as possible after the water smoke is off, the ends of the bricks will be found to have swelled and show but a slight degree of solidification, while the middle or central portion will be thoroughly hard and sound, or normal size and dark cream color. To all appearance these bricks look as if their ends had been protected from the fire in some manner, whereas, in reality, the heat has been conducted from the ends to the interior, where the material gives every evidence of greater fusibility than at the ends.

These peculiarities are not a result of any particular style of kiln, or any particular kind of fuel, but seem to be clearly identified with the composition of the kiln gases in reference to their oxidizing or reducing character.

The fact that the brick will solidify under the influence of a neutral kiln atmosphere, at a comparatively low burning temperature, without swelling and subsequently shrinking, so that the burnt bricks are practically of the same size as the original raw brick, has led me to believe that the presence of the carbonic acid gas in the kiln atmosphere is effective in preventing the complete dissociation of the carbonates until the melting point of the basic carbonate is reached, when it acts as a flux to the silica and silicates.

I appreciate that this is an unusual theory of the reactions in the burning of calcium clays, and one that requires absolute proof before it can be accepted. Nevertheless, the fusibility of partly decomposed calcium carbonate, or basic carbonate, has been demonstrated in the laboratory and the melting point of the same found to be 1020 degrees Centigrade, but it was necessary in making this determination to enclose the carbonate in a vessel to prevent the escape of the carbonic acid gas.

This melted basic carbonate solidifies under cooling to a mass having the physical characteristics of marble.

The main point at issue in this manner of reasoning would there-

fore be the possibility of the existence of the basic carbonate as such at the time the fusing temperature is reached.

Looking further into this subject, we find that the decomposition of the carbonate of calcium is dependent upon the temperature and the pressure of the surrounding carbonic acid gas. According to experiments, the tension of dissociation becomes equal to atmospheric pressure at 812 degrees Centigrade. In view of this, we find it is possible to heat the normal carbonate to a temperature of 812 degrees Centigrade, in an atmosphere of carbonic acid gas, before decomposition commences, and as decomposition does not proceed very rapidly, even above that temperature. As long as the pressure of the carbonic acid gas in the surrounding atmosphere is kept up, it appears very feasible to reach the melting point before the decomposition has proceeded very far, and the remaining basic carbonate would therefore possess a lower fusing point than the calcium oxide produced in the oxidizing fire, which would probably occur at about 1100 degrees Centigrade.

Expansion, as a characteristic of limestone during its calcining, is partaken of by clays in proportion to the amount of the carbonate present, and the above theory of reactions would account for the absence of expansion of the brick in a neutral kiln atmosphere.

The presence of sulphur in the kiln gases must, of course, also be taken into account in burning calcium clays, as it adds to the difficulties of burning with an oxidizing fire by forming sulphuric or sulphurous oxides, which in the presence of water vapor would displace the carbonic acid gas in the carbonate and form a less fusible sulphate.

The extraordinary requirements outlined above have rendered the application of the continuous system of burning a rather difficult problem, the reason of which will appear more conspicuous when we bear in mind that one of the principal sources of fuel economy in the continuous system is the use of hot air, taken from the burned bricks, for supporting the combustion of the fuel; hence, it requires but a small amount of fuel to raise the temperature to the required degree, resulting in a very oxidizing atmosphere.

Realizing that an extremely oxidizing fire was unsuitable for this clay, I designed a kiln in which it would be possible to regulate the composition of the gases ot suit the requirements.

This is attended, however, with a greater fuel consumption than what is ordinarily required in kilns of this kind.

The kiln consists essentially of two parallel tunnels, connected at both ends. These tunnels are provided with drop arches at intervals of 18 ft., against which the bricks are set in tight walls, transverse to the direction of the draft, in such manner that when the kiln is set full and in operation, it forms a series of 18 up and down draft compartments, each holding 34,000 brick.

The fuel is introduced into the kiln in the form of gas, of which carbon monoxide and free carbon constitute the principal ingredients.

The gas is generated in furnaces, located in the outside retaining wall, and is led through an uptake and a transverse flue up over the main arch and thence into the kiln through slotted openings in the arch. On reaching the interior of the kiln these gases are mingled with hot air drawn from the cooling bricks. The products of this combustion, with a large surplus of air, are drawn through the next compartment and, after having traversed it, are mixed with the gases from the next furnace. This operation is repeated in the next two compartments.

The amount of hot air taken from the burnt brick directly into the burning chambers is so adjusted that it is practically all consumed after having passed the last gas inlet, and the products of this last combustion are then suitable for applying the finishing heat in the compartment ahead of it.

The bricks in the intermediate compartments through which the more or less oxidizing gases have passed are already burnt and are therefore not susceptible to the chemical influence of these gases.

A separate system of flues furnishes means for transferring surplus hot air from the cooling to the water smoking compartments, which it is not desirable to take directly through the burning compartments.

During the progress of burning this clay I have found it necessary to curtail the drafts of hot air from the burnt or cooling brick into the burning compartments to a very great extent, and instead admit more cold air through the last fire. This cold air requires the admixture of more gas than the hot air, and the resulting products are therefore less oxidizing and more suitable for the purpose, but it means the expenditure of more fuel.

In the burning of brick containing a fair percentage of clay the first mentioned system of operation proved satisfactory and the fuel consumption per thousand brick averaged about 250 lb. of coal.

With the last mentioned system of operation, necessitated by a larger percentage of carbonate in the clay, the fuel consumption has been increased to 330 lb. of coal per thousand brick.

The quality of coal used is Hocking Valley in proportion of two-thirds lump and one-third screenings.

With the object in view of curtailing the expenditure of fuel and waste of heat resulting from the taking of more cold air from the exterior and less hot air from the cooling brick for supporting the combustion—only for the purpose of creating carbonic acid gas with which to convey the heat through the kiln—I have commenced some experiments in setting the brick which is intended to retard the dissociation of the carbonates so that the heat can be carried through the kiln with a more oxidizing atmosphere. These experiments consist in placing the bricks close together in 4 and 8 in. walls from bottom to top, with suitable arches along the floor and spaces between the walls to allow a proper distribution of the heat. Placed in this manner, the bricks will require a slower drying, but the ill effects of an oxidizing atmosphere will be reduced to a minimum. The results of these experiments have not been ascertained to the present time. Perhaps in a day or two they will turn out, and if successful, I have no doubt that the fuel consumption can be slightly reduced.

Mr. Joannis: I suppose, as the French say, it is the first step which costs, and there is not room for very much discussion of this paper. I think it is more a matter of questioning to get more information from the gentleman who contributed so able a paper. You mentioned in connection with the results of the oxidized atmosphere that the brick first swelled perceptibly and shrank afterwards. Can you give us the proportion of shrinkage and swelling?

Mr. Youngren: If the kiln is heated uniformly from top to bottom before any part of it has commenced to shrink, the swelling in a kiln of thirty courses, depending some upon the proportion of the carbonate in the clay, would amount to as much as four or five inches.

Mr. Joannis: And the subsequent shrinkage would be how much on that same brick?

Mr. Youngren: If the same brick was properly burned, that is, burned hard in that atmosphere, it would shrink down nine to ten inches, at least, above the highest swelling.

Mr. Joannis: You say it would lose four inches then?

Mr. Youngren: Yes, or more.

Mr. Joannis: In this new method of setting your brick you speak of the increase of fuel consumption necessary to attain that result. Is there any perceptible percentage of better brick?

Mr. Youngren: Those brick have not been taken out yet, and

we only set four chambers, about 150,000 or less, for experimental purposes. The brick are being taken out of the kiln now, and any of the gentlemen who wish to go out to-morrow afternoon can see the results of this experiment.

(We are glad to announce that these brick turned out in excellent shape.—Ed.)

Mr. Buckley: I don't feel in position to question in any manner the theory which Mr. Youngren has evolved with respect to the chemical reactions taking place in the burning of calcium clays. However, I felt from what little I know of the calcium clays of Wisconsin and other calcium clays that the action and reactions involved in burning these clays—I speak of the chemical reactions—are not exactly in accord with those which Mr. Youngren has outlined. I do not think, however, that this is just the place to bring forward or discuss those reactions. I think that the work which Mr. Youngren is doing is exceedingly important. About three-quarters—I guess I can say easily three-quarters—of the brick manufacturing establishments in Wisconsin are dealing with calcium clays, and the problem which these men have before them is that of reducing to a minimum the cost of burning these clays. The first thing that they want to know—the first thing they ought to know—is the actual amount of heat required to burn the brick under what I might term ideal conditions; how much heat is required to burn the clay to what we know as a hard brick. The next problem then which presents itself to the brickmaker is to acquire as nearly as possible these conditions. He wants to reach as nearly as he can these possible conditions. The only way that this question can be solved is for some person to work out by experiment the actual cost—the actual minimum cost—of combining the calcium and magnesium carbonates in the clay with the silica, iron oxide, potassium and sodium contained in the clay to form a silicate, such as is found in a hard burned calcium clay brick. I am inclined to believe that the percentage of sodium and potassium (soda and potash) and iron contained in the clays influence to greater or less extent, perhaps to a considerable extent, the temperature at which the calcium clays are burned throughout this region. That percentage varies considerably in different parts of the region, and even in clay from different parts of the bank which you are working.

So, I might suggest that while Mr. Youngren is experimenting along this line, he take into consideration the potassium, sodium and iron in these clays, because these constituents are sure in the process of burning to lower the temperature at which the condition which we know as incipient vitrification is produced. It is rather a difficult matter to discuss this problem, which is really a scientific and chemical problem, in such terms that it will be understood by the brick manufacturers. I think we must have the problem worked out from a scientific basis, and the result given to the brick manufacturer in a form in which he can apply it himself, without the necessity of his following through an intricate maze of chemical reactions which take place in the burning of the brick in the kiln. Therefore, I do not wish at this time to begin a discussion of the chemical problems involved in this paper.

Mr. Youngren: I would like to say a word or two with reference to the fluxes existing in the clay. I have noticed very clearly in the burning clays here which contained a larger per cent of the clay base, and consequently a larger per cent of sodium, potassium and iron, that they can be burned much cheaper and much easier than the clay ordinarily called sand clay, which really has more carbonate in a gritty form than the other clay. The clay which contains a great deal of clay base can be burned much easier, due to the influence of these other fluxes, and I am inclined to think that I can disregard the carbonates in that case entirely; but when we come to a clay that contains very little clay base and more carbonates, we have to work on a principle of utilizing the carbonates as fluxes. As I said in my paper, when we do it in such manner so as to expel the carbonic acid gas from this material and reduce the carbonates to oxides, the swelling and subsequent shrinkage is so great that we cannot produce a marketable brick under those conditions. There is a question in my mind, of course, whether or not the sulphur has any great effect on the carbonates in transforming them to sulphates, which would be less fusible, and I would like to ask Mr. Buckley whether in his opinion, transforming a carbonate by the presence of sulphuric acid into a sulphate would increase the volume of the brick or body in which it was contained.

Mr. Buckley: I think under ordinary natural conditions in the kiln that there would be an increase in the body of the brick through the presence of the sulphate. That would be my opinion in reference to that matter. I don't know what your experience has been.

Mr. Youngren: I have not taken any close observation as far as that is concerned; that is, not sufficiently close to be able to determine.

Mr. Buckley: I should judge that this would be a difficult matter to determine, when it is taken in conjunction with the effects of the carbonates of magnesium and calcium. The high percentage of calcium and magnesium carbonates in the clays have such a marked effect on the swelling of the brick during the process of oxidization that it would be a very difficult matter to measure the effect of the sulphate. This certainly is an admirable paper, and it is an excellent, and in fact, I may say, the best contribution to the subject of calcium clays which we have had in the state. I am very greatly pleased to know that the subject is being taken up and an attempt is being made to solve this problem, and if it is worked out with respect to the Milwaukee calcium clays, it is going to be applicable not only to Milwaukee, but to the entire eastern part of the state, with slight modification. If the principles governing the problems are work out, they can be applied to other sections of the state, and can be available to all the brick manufacturers, and I trust that Mr. Youngren will stick to the problem and work at it until it is solved to the satisfaction of the brick manufacturers and the scientific interests connected with the brick industry.

The secretary then read the following paper:

WHAT WE HAVE LEARNED ABOUT THE MANUFACTURE OF STIFF MUD BRICK.

By William Meadows, of Burlington, Wis.

I fear I cannot say anything edifying or instructive to this body of intelligent men, but not wanting to be benefited by the relation of others' experience without an attempt, at least, to render an equivalent, I have decided to give you a brief description of our mode of operating and manner of making stiff mud brick.

Our plant is located in the western part of Racine county, and our output is largely in farm drain tile—in fact, the plant was mainly built for the manufacture of that commodity, and we only turn out from one to two million brick per annum, which I am aware is a small amount compared with the output of many firms represented here.

Our clay is a surface clay, from 12 to 15 ft. in thickness, a very stiff blue clay, and very free from lime or grit of any kind, so much so as to require it to be mixed with one-fourth to one-third sand. We have two clay bins and a Pott's disintegrator accessible to both. Each bin holds clay enough for a day's run of thirty or thirty-five thousand brick. When working out of one we are filling the other, one man being engaged in spreading the clay evenly over the whole surface of the bin as fast as dumped. Three loads are spread and tempered, then one load of sand spread, and con-

tinuing thus until the bin is filled. The clay is then shoveled to the disintegrator, with long-bladed tile spades, and thus the clay and sand are evenly mixed. After passing through the crusher the clay drops on a conveyor made of a 12-in. canvas belt, and is taken to the machine.

Our brick are side-cut, 10 brick at a time, and taken from the table five at once with a clamp, and placed on a pallet holding 10 brick, with five pallets on each truck, making 50 brick for each wheeler for each load. Each wheeler, while the brick are being placed on the pallet, is required to separate them a little so the air can get all around them, thus securing uniform drying and preventing warping, which operation is very important, in order to have straight brick when burned. Each pallet is then placed on shelves in the racks. A diagram of our rack is before you and I invite your criticism. Our motive power is a 35-h. p. engine, with a 55-h. p. boiler.

A day's work of 10 hours is 30 to 35 M. brick. A minimum working force, when running on brick, is 10 men—one engineer, two pitching clay to disintegrator, one cutting off, one placing brick on pallets, four wheelers, and one man to assist in placing the loaded pallets on the racks, where they remain untouched until dry enough to be placed in the kilns. Three or four days, according to the condition of the weather, is required for the drying process. Two wheelers to one setter is necessary to get the brick in the kiln for burning—each setter placing 20 M. brick a day—six on six, face to face.

We have three kilns of 10 arches each and 25 M. brick to an arch. Our kilns are clamps, the walls being made of refuse brick, 20 in. thick at the bottom, narrowing to 8 in. at the top, outside slant. In order to use coal in burning, we have put in a 30-in. coal grate in end of each arch.

We use both wood and coal in burning—water smoking with wood only for 36 to 48 hours, or until steam ceases to rise, then we burn wood and coal at the same time, sliding the wood to center of kiln, using best lower vein Brazil block, because it burns freer, with more flame and less clinkers. We burn from seven to seven and one-half days, the last day with light, flashy wood.

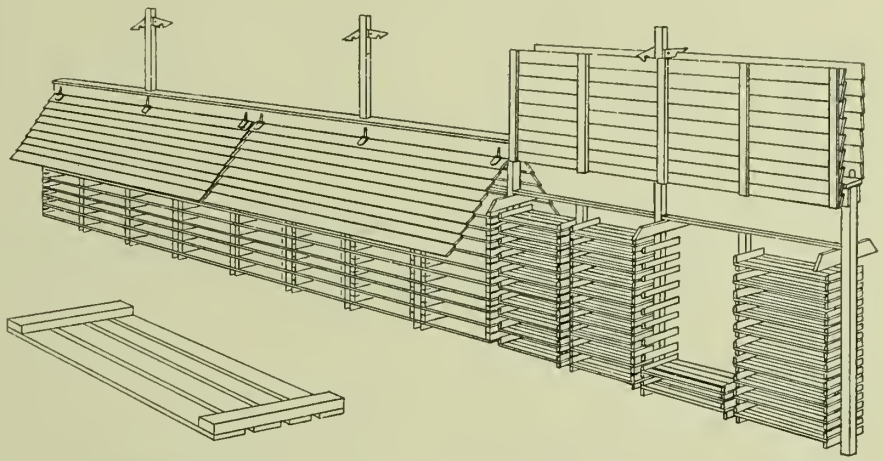
For the last 12 years we have made only a stiff mud brick, believing that process, without style of machinery, to be the most economical to manufacture, and productive of the best quality of common, stiff mud brick. We have never tried repressing, for the reason that our brick closely resembles a repressed brick, and besides, the demand for that class of goods in our locality is not sufficient to warrant the outlay.

I have given you this brief outline of our manner of making a stiff mud brick, not because we claim for it superior merit over every other maker, but because it is the best our limited experience and judgment has been able to devise, and if I have enabled some one to catch a new idea that may be beneficial to him for future use, my effort has not been in vain. I will say that this paper was written for the sole purpose of inviting discussion. I will willingly answer any questions which the members desire to ask.

Clifford Chase then read the following paper on the same subject:

In the manufacture of brick by the stiff mud or wire-cut process we deviate most entirely from the older and better known method of molding brick, where, in the molding process soaking and pugging the clay for a longer or shorter period, so as to reduce it to a plastic state, is resorted to. In the stiff mud process very little, if any, water is used where the clay is taken directly from the bank.

"Brick" Illustrates Here



A Valuable Contrivance.

DRIER DESIGNED AND BUILT BY WM. MEADOWS, BURLINGTON, WIS.

The degree of success which enters into the manufacture of brick by this system depends not only upon the brick machine itself, which should be of the best pattern obtainable for the work required, but with the different machines used in preparing the clay. I think that numerous failures to operate successfully by this system can be traced to the lack of this necessary adjunct.

The machines used for this purpose must be strongly built, as, instead of a yielding mass, you have the tough raw material, with lumps of greater or less size, which have to be cut and worked up, and that quickly, too; and as the clay is generally dumped into the first machine or granulator in quantities of from one to two yards at a time, it means an unequal strain on the wearing parts of the machinery.

In this illustration I have reference to machines of large capacity, such as are in use in or near this city. The clay, as stated above, is dumped direct from the bank or pit by cart or car into the first machine or granulator, which is horizontal and provided with the shaft, in which the knives are fastened by keys and so set that the clay is worked from the end into which it is dumped to the opening at the farther end, where it falls of its own weight on to the crushing rolls, where it is further reduced and the stone taken out. Directly under these rolls, which are conical and tapering, runs the belt conveyor on a frame set at the proper angle or incline, which takes the clay as it comes from the rolls to the second floor, where it is deposited in a machine very similar to the granulator, and where water can be added if necessary; the clay is here worked over as before, and carried towards the opening at the end directly over the brick machine, into which it falls through a hopper, where the knives of the brick machine take up the work and pass the clay along the auger, which, with a powerful twist,

forces the clay through a die in an endless bar on to a belt, which carries it along on rollers to the table where the bar is cut automatically into the proper length for brick, and turned on edge ready to be taken off. The green brick should be of a consistency to permit hacking six high, free from finger marks; throughout the operation from the depositing of the clay in the granulator to the finished product ready for drying, the clay is not handled.

To operate this machinery the power required would vary according to the toughness of the clay, 150-horse power, in my judgment, being the minimum.

In 1883 we installed a small auger machine of the brick and tile variety, on our yard, which, without any machines to assist in preparing the clay, was a dismal failure. We could pile the whole outfit, with engine included, into two of the clay preparing machines of the present day; what was learned by that failure is evident.

First—A machine of insufficient strength for our tough material and a total absence of clay preparing machinery.

Second—A boiler and engine of too small capacity.

The same argument applies to any system that you have, or may contemplate. You will find it to your advantage not only to have ample strength in your brick machine proper, but suitable machinery to help prepare the clay. Not only this, but you must have ample power to drive it, the tendency always being to increase the load. Numerous instances in our immediate vicinity could be cited where wire-cut machines have in the past been tried and in the majority of cases failed for the reasons above referred to.

After all, every clayworker must use his own judgment and solve for himself the question of a suitable system for the manufacture of brick from clay at hand in his particular locality.

I maintain that it is the use of auxiliary machinery which in a continuous process reduces and tempers the clay, destroying the lumps and removing pebbles, in fact, making it fit to be worked in a brick machine, which has done so much towards perfecting this system, and made the manufacture of wire-cut brick with our clay a possibility."

Mr. Buckley: It is not my purpose to discuss all of the papers, but I simply want to emphasize the very important fact that Mr. Chase has brought out in the admirable paper which he has just read, that is, that it is the auxiliary machinery which has done so much to perfect the stiff mud process of manufacturing brick, not only in this state, but in every other state. It is the proper preparation and handling of the clay before it is introduced into the brick machine that controls very largely the character of the brick as they are carried to the dry yard. During the last two weeks in my wanderings through Missouri I have had this very point brought to my notice several times, and brick manufacturers of prominence in Missouri have said to me: "We never knew how to make brick until we learned how to prepare our clay before it entered the brick machine," and so I don't think that this point can be emphasized too strongly or can be brought before this convention too many times,—the necessity of thoroughly preparing the clay before it enters the brick machine; and I wish to thank Mr. Chase for bringing this point out so clearly and strongly before this association—it is an exceedingly important matter.

Mr. Chase: That is something I brought out in my paper last year at Madison and Mr. Finnegan sat down on me. He said if he had so much money to buy the machinery and so forth, what would he need with a brick yard.

Mr. Finnegan: In my experience, if I had known as much 25 years ago as I do today about pulverizing clay I would be better off. I don't care how good a machine these fellows give us, we must prepare the clay; we only ask that machine to do the molding. The clay must be in the proper form to make brick when it goes into the clay machine, and then you can go to bed with a good conscience.

The President: You have special reference to the soft-mud process?

Mr Finnegan: Soft mud and stiff mud. Everything has to be prepared before it goes into any machine, and just as soon as the brickmakers will take that into consideration they won't get gray headed so fast.

Mr. Randall: Mr. Finnegan makes the remark, and I don't know whether I understand him right or not—something about the conscience before going to bed. I want to know if that is the reason why some of those fellows didn't go to bed last night.

Mr. Finnegan: They were not making bricks.

Mr. Fifield: In Mr. Meadow's report I got a very valuable idea, not paticularly from the paper, but from the sketch, in the way of opening the pallet sheds and racks. I have been looking for a way for a good while, so that we could raise the roof. I see he has that solved.

The President: For any brickmaker who is contemplating the building of racks, the sketch drawn by Mr. Meadows will give some good ideas.

Mr. Finnegan: I think Major Hinkley has the most complete pallet yard in northern Wisconsin.

Major Hinkley: I didn't know that there was anything remarkable about it; we simply followed out a pattern which Mr. Finnegan had set when we bought the yard. Only that he had room for perhaps only thirty or forty thousand brick, which would be about a day's run of the yard; when we bought it we extended the sheds and made room for 400,000, and we use 80,000 pallets. In our work we use one of the box machines of five brick molds, and as the molds come from the machine they are dumped onto a pallet large enough to hold five bricks; these pallets are removed to wheel-barrows and wheeled to the racks. These racks are between the machine and the kiln. The wheelers take the pallets and slip them onto the racks. We have some boards that hang down along the sides to protect them from the weather, and we find that in fairly good drying weather it takes about ten days to dry the brick sufficiently to send them to the kiln. In very bad weather it takes about 15 days. We calculate to have shed room enough for 15 days' run in case it is bad weather. I don't know that we have ever lost a brick from the weather since we have been working on that system. I think we have a fairly economical method of drying for our northern climate.

Mr. Buckley: I will say that if any one expects to visit a brick yard in southern Wisconsin, I suggest that he visit Mr. Meadow's yard at Burlington. I think he has some features, especially connected with the construction of pallet sheds, that will be very valuable to you; and I assure you, that if you visit this plant, you will be shown everything connected with economical working. There has just come into my mind a little device which I saw last week in Missouri for transferring the pallets from the brick table to the trucks. I have not the device clearly in mind—but instead of the man at the table taking the pallet in his hand and lifting it around and placing it on the trucks he has a pedal that he works with his foot, which raises the pallet up on an incline plane, down which they move by gravity to the man whose duty it is to load the trucks or barrows. It is a very simple little device, and if any of you would care to know definitely what it is, I will be very glad to give you a careful description of it if you care to write me. I have never handled brick from the table,—but I understand that it is a very tiresome job and that most men are wearied before the day is over simply by the process of handling the pallets from the table to the truck in which they are carried away. The machine which I have mentioned, is a very novel and interesting little labor saving device.

Mr. Hinkley: Before we adjourn I would like to get back to

that amendment to the by-laws, and for the purpose of bringing it in good shape before the convention this afternoon, I move that a committee of three be appointed to revise the amendment as offered, to suit the views of the convention.

Motion seconded and carried. The President appointed the following committee:

J. W. Hinkley, E. R. Buckley and Clifford Chase.

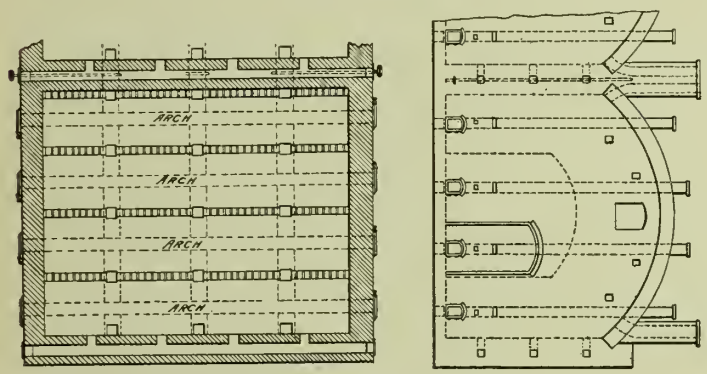
Adjourned to two o'clock p. m.

(To be continued.)

The Lambert Continuous Kiln.

Ephraim Lambert of Maryville, Mo., has invented several improvements in kilns and the latest, patented Dec. 3, 1901, may be of considerable interest to those who have followed in our columns the various types of kilns operated on the continuous process and described in our columns from time to time.

The Lambert kiln is really a number of kilns which are erected adjacent to each other and in intimate communication by means of



LAMBERT CONTINUOUS KILN.

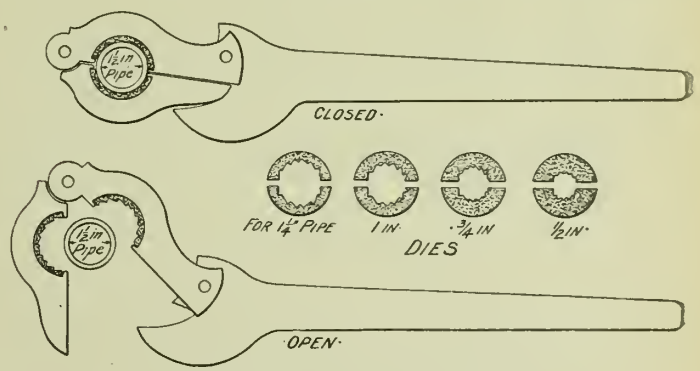
specially designed flues which allow of the firing to be carried from kiln to kiln and the waste heat distributed to any kiln at will, in exactly the same way as is done in the ordinary continuous kilns. The particular advantages claimed for the Lambert kiln are, in the first place, that these kilns can be constructed at will according to the desired capacity of the plant, without interfering in any way with the efficacy of those already constructed. The illustration shows the front elevation comprising one kiln and the commencement of its neighbor and also a horizontal section of a kiln taken on a line with one of the flue openings located in the partition wall. The walls of the kiln are constructed in the usual manner of the proper thickness to resist the high temperature created within the burning chamber. The floor of the kiln should be preferably above the surface of the earth for convenience for firing and prevention of flooding. The fire arches or chambers wherein the fire is built are provided with suitable grate bars and the fire chambers are connected by a series of main flues as shown in the dotted lines of the horizontal section. Between the fire dampers and parallel therewith are located connecting or trench-like flues so disposed as to intersect the main flues and placing the fire dampers in direct connection with them. The main flues are provided with a vertically disposed opening extending upward and communicating with the interior of the kiln where the connecting flues and main flues intersect, the object of this being to permit the heat to pass upward and through the mass of brick, tile or pottery with the greatest of efficiency. The usual care in construction, of course, must be observed.

The kiln is provided, as is common, with a roof arch with a series of vent openings in the top closed by governing dampers. Each of the main flues is provided at each partition wall with a controlling damper so that the line of draft may be confined at will to any place, the controlling rod passing upward above the roof line while similar dampers controlling the outer flues are disposed horizontally through the walls of the kiln, affording easy manipulation by the operator.

In each of the partition walls and in the end walls are several horizontal openings, one above the other, extending throughout the entire length of the walls and provided with caps or dampers which allow for direct and unobstructed communication from the outside atmosphere into the burning chamber. The openings may be of any number desired according to the height of the kiln and it is by means of them that the initial draft is obtained to cause a down draft in the burned kiln so that the surplus heat may be directed into the next adjacent unburned kiln. Firing is commenced in the usual manner, the dampers of communication with adjacent kilns being closed and when the contents are thoroughly burned in the first kiln the dampers are opened, a small fire is commenced in the next kiln to be burned and firing is continued in the usual manner, this process being repeated from kiln to kiln until the line of kilns has been burned. Thorough control of the amount of heat admitted to each kiln is obtained easily by the dampers. Further communications and drawings of this kiln may be obtained by application to the inventor.

A Very Valuable Pipe Wrench.

To those who are using steam driers and a quantity of piping in their plants the value of the new wrench called the "Universal Anti-Crush" wrench, invented by S. W. Ferguson, superintendent of the East Liverpool Pottery Co., East Liverpool, O., will be seen at once. Mr. Ferguson was an active delegate at the recent American Ceramic and N. B. M. A. conventions and had a sample of his wrench with him, which was much admired by those who had the privilege of examining it. This wrench consists of a handle with swivel jaws. An examination of the illustration will show that when once the jaws are closed upon the pipe and that they are engaged by the clutch at the end of the handle that it is impossible for the wrench to slip and at the same time it is impossible that the pipe be crushed in any way. The jaws are lined by corrugated lining pieces which grip and do not crush the material within. Repeated tests with the wrench have shown that



FERGUSON ANTI-CRUSH WRENCH.

the pipe will give way in any part but between the jaws of the wrench, and for the purposes of removing old piping the Ferguson wrench is probably without equal. The illustration shows the wrench open and closed. Three sizes are made and each is adjustable to any of the intermediate sizes. Full details and prices can be obtained by application to Mr. Ferguson.

Good Advice to Clayworkers.*

BY WM. H. HUNT, CLEVELAND.

Another milestone has been reached in the life of this association. It is with rare pleasure that I welcome to the metropolis of Ohio the members of the National Brick Manufacturers' Association, assembled in its sixteenth annual convention. It was in this state that our organization had its birth. While we must concede to our sister city, Cincinnati, the honor of having christened this organization, we Clevelanders nevertheless take delight in honoring its sixteenth birthday.

My personal observation of the work of the association covers the period of time since the annual convention held in this city, in this very building, seven years ago. To be thus honored with a second meeting within so short a time gives us just pride in the recognition thus accorded our great and beautiful city. In my dual capacity as president of the association, and as chairman of the local entertainment committee, I can assure you that a pleasant time is in store for all. The president of the association has taken counsel with the chairman of the committee, and is thus enabled with confidence to make this report.

It has been my good fortune to serve as your president during a year of unprecedentcd prosperity to the business interests of the country. Notwithstanding the loss of our country's beloved president, and the threatened depression of business because of this calamity, our institutions have prospered without interruption and the opening of this new year is full of promise. The year 1901 surpassed all previous years in the extent and magnitude of building operations. In all the large cities, the increase has been from 15 to 25 per cent. From every section of the country comes reports indicating that the present year will eclipse any previous period in the history of the building industry in the United States. This means a continuance of the great demand for all grades of materials which enter into building construction. Necessarily the paving and fire brick manufacturers, the terra cotta and tile makers, will have generous demand for their products, with general business conditions so prosperous.

During the past year much difficulty has been experienced in commanding transportation facilities adequate to the demands of the business. Millions of dollars, however, are being expended for cars and motive power; hence that menace to the clayworking interests will in some measure, no doubt, be relieved this year. With many manufacturers it has hardly been a question how to secure business, so much as how to properly serve it.

The greatest progress in the clayworking industry has doubtless been made during the last twenty years. We have only to contrast the present conditions with those of two decades ago to realize the substantial advancement which has actually been made. It is but a comparatively short time ago that brickmaking was generally regarded as a clumsy, disorganized, unsystematic, rural industry; the men engaged in it believed to be somewhat more menial in their occupations than their neighbors in other branches of trade. The development of the cities and towns of the country, with the consequent demand for more lasting and fire-proof materials, has called into existence thousands of clayworking institutions, from one end of the country to the other, the natural forces which direct competition having evolved a distinct manufacturing business of high order, wherein science, art, the highest technical skill, and the best business ability contribute to make it a calling than which none is more noble.

I am sometimes impressed with the belief that the fifteenth century was the greatest of all the cycles of time that have come and gone. Had it not been for the discovery of new countries the wonderful progress which has marked the last century, and which has been in so great part due to the genius of our great Republic, would have been practically impossible. It would appear that the father of all good gifts had kept in reserve for our use this great country until such time as we had advanced sufficiently to appreciate and utilize the wonderful inventions and the great practical ideas which have been developed in recent years.

When compared with Marconi's wireless telegraphy, with Santos-Dumont's air-ship, and the Holland submarine war vessels, silently piercing the ocean's depths, carrying destruction in their path, the achievements of the worker in clay may seem unimportant. But great progress has been made, nevertheless, in our own chosen line. The quality and standard of the product of the clayworker is higher today than was dreamed of but comparatively few years ago. Time was when art perished with the artist. Time was when a rare product of pottery died with the maker. Happily these times have passed and today the constant aim is to improve and perpetuate art in all lines of industry.

Nothing is more helpful in the development and advancement of the best ideas in all branches of business than trade associations. In this association, I was impressed by an extract from an article recently called to my attention:

"In every trade we have first-class merchants, second-class and third-class. After the first-class, the second-class and third-class merchants get together, the first-class merchant will set the standard for the second and third-class merchants; in other words, they will raise the second and third-class merchants to their ideas of business; whereas, if we have no trade associations of that sort, the first-class merchant naturally associates with the merchant of his standard; he stands away from the trade in general, his good influence with the trade is lost, and the result is that as a rule, the second and third-class of men go right along without improving. We believe that we can trust a member of our association when we are united, but cannot as readily do so when separated. If the best men should step out, all their good influence on other men in similar lines of trade would be lost."

The writer of the foregoing expresses a benefit derived from association, which this national organization has realized in a generous and substantial way for many years. Organization has come to be regarded a necessity among business men in all branches of trade. This is an era of united effort. Competitors no longer regard each other with enmity, thrusting contemptuous glances at one another with smothered maledictions when passing by. The day for all that has passed. Men engaged in the same pursuits, while perhaps competitors, hardly regard each other as opponents. It is right that they should stand together for their common good.

Our association is today larger and stronger than ever before in its history. Our growth, however, must not lead to a feeling of undue satisfaction. Much has been accomplished; there is yet much to do. The art of brickmaking is broad and its ramifications are so extensive that but a small part of the truth has yet been established.

The science of political economy, which is recognized today, more than ever before, as the basis of success in business enterprise, should be a part of the study of every member of this association, and as an organization, we should encourage as far as lies in our power, a more liberal adoption of its fundamental principles.

In the work of the association have we not allowed ourselves to dwell too extensively upon its technical and mechanical sides, to the exclusion of thought concerning the business end of the clayworking industry? We have accomplished much when we make brick of high standard, and effect every possible economy consistent therewith, in manufacture. But beyond this, our offices may need attention. The manufacturing end of the business should be departmentized, making it possible to determine with accuracy the results

*President's address at the 16th Annual Convention of the N. B. M. A

and costs of each department, as only by so doing is it possible to know where the plant is weak or strong.

Again, if our great industry is to take rank in the commercial world with iron and steel and lumber, we must introduce into our methods the best business practices, directing the sales of our product, our collections, our records of account, to conform to the established rules of all important manufacturing and commercial institutions. Unquestionably the marked successes among men engaged in our pursuit have been because of close attention given features of the business which are generally regarded as minor and unimportant details. From the claybank to the job, the successful brickmaker must know his business.

For instance, the successful clayworker should study carefully all conditions surrounding the clay bank. He should know the chemical analysis of his clays, to determine the presence of properties which must be taken into consideration in the treatment of his crude material. Likewise, as to the water used in his boilers. A purifier, if necessary, costs little money and is easily installed. The question of fuel is an important one, ofttimes overlooked not only in brickmaking but in other industries where it plays an important part. The cheapest coal is often the most expensive to use.

In considering the proposition of brickmaking, the question of uniformity throughout the entire process is of paramount importance. Clay should be of uniform condition and bricks set uniformly in kilns from end to end and from side to side, in such manner as to insure uniform draught throughout the kiln. Uniform results are only possible by charging the kiln uniformly in all parts. From beginning to end, in setting, drying, firing, increasing temperature and cooling, uniformity of method is most essential. Care and skill must be exercised during this entire period, if sound and well-burnt brick are to be produced.

Give patient consideration to new appliances that may effect possible economies or improvements in character of product. Above all, keep machinery particularly, and buildings as well, in good repair. To neglect this is not true economy.

Every possible safeguard should be introduced for the prevention of fire. Many times the closing up of an opening in a brick wall, the installation of extinguishers, barrels of water, ladders communicating with roofs, etc., all of comparatively little expense, will bring a reduction in cost of insurance.

The question of the best and safest method of lighting the plant should not be overlooked.

I have a thought or two in connection with what might be termed office management. A sufficient force should be employed to properly care for all details. Due care should be exercised in the selection of these employes, who should be recognized as co-laborers, not as mere machines, thus enabling them to feel that matters affecting their company just as fully affect them individually. They should be given seasons of recreation.

Correspondence should be promptly acknowledged and scrupulous care exercised in making and keeping promises. Judicious advertising is essential.

Never misrepresent your product for the mere purpose of effecting a sale. It may clean out the yard, but will serve as a boomerang should you have future dealings with the same customer. Tell the absolute truth.

Should sales be made through an agency, fortify the agent with such information as will enable him to present fairly, your product, as regards quality and facilities for serving the order. Many times controversies in adjustment of accounts are due solely to the lack of observance of this precaution. Know the worth of your product; put a price upon it and maintain it. Allowances and drawbacks can be avoided by having a perfect understanding in the beginning, not alone as regards the character of the material, but all points relating to the transaction, such as terms of payment, times of delivery, and other essential matters.

When asking your railroad for assistance or co-operation, first satisfy yourself that the request is reasonable.

Charge against cost of making brick, every item of expense which properly belongs there. It is too general a custom to add to construction account, or accounts representing plant and equipment, money expended for machinery and appliances, or repairs to machinery and buildings, which merely replace or maintain your original investment. Dont deceive yourself in determining the cost of your product. Proper annual allowance for depreciation and wear and tear of plant should be made. Reduce the possibility of errors or mistakes to a minimum—in other words, know your business, every detail of it.

These suggestions, while made from the standpoint of one engaged in manufacture of pressed brick, necessarily a business of many details, apply with equal force to every clayworking establishment, no matter how large or small. If this convention should succeed in awakening an interest in these features of our business, a great and lasting good will have been accomplished.

The subjects for discussion are varied and will bring out the best thoughts of the best minds engaged in brickmaking. To these discussions I am sure you will turn gladly, and that from them profit will accrue. Do not neglect, however, the opportunity afforded at this annual meeting for cultivating the acquaintance of your fellow brickmakers. Seek a quiet talk in the lobby. A comparison of business methods, results gained by experiments, details, the exchange of ideas received from personal experinece and observation, are most valuable features of these annual meetings. In these personal talks our convention fills a manifest need to all of us.

In concluding the work of the year, I desire to say that it has been a very pleasant experience to me to serve the association as its president. I hope for my successor the same full measure of co-operation and good will which have been accorded to me; that our association may benefit largely from this convention, and that it may go steadily forward to still grander achievements, is my earnest wish.

The N. B. M. A. Exhibits.

One of the most creditable exhibits of brick and brick machinery ever presented at any convention was made in the large exhibit hall at the Hollenden Hotel, and this success was largely due to the untiring efforts of S. A. Williams, chairman, and W. E. Ellenberger, secretary of the exhibit committee. The tables were decorated with colored stuffs and many painted signs attractively got up adorned the walls and the pillars heralding the various products installed around and beneath. The exhibits were varied and numerous. The firms and companies represented were as follows:

EXHIBITING BRICK, TERRA COTTA, TILE, ETC.

The Winkle Terra Cotta Co., St. Louis, Mo.; New York Architectural Tile Co., New York; Fulton Fire Brick Co., Fulton Mo.; Owensboro Brick & Sewer Pipe Co., Owensboro, Ky.; M. E. Gregory, Corning, N. Y.; Withnell Bros. & Smith Co., Omaha, Neb.; Barr Clay Co., Streator, Ill.; American Fire Brick & Clay Co., Mineral City, O.; Columbus Brick & Terra Cotta Co., Columbus, O.; Stowe & Fuller Co., Cleveland; Cleveland Hydraulic Pressed Brick Co., Cleveland; Cleveland Brick Co., Cleveland; Nelsonville Sewer Pipe Co., Nelsonville; Malvern Clay Co., Malvern, O.; Crown Fire Clay Co., Akron, O.; Standard Tile Co., St. Louis, Mo.; Saginaw Clay Mfg. Co., Saginaw, Mich.; Carrollton Granite Brick Co., Cleveland; Canton Sparta Brick Co., Mineral

City, O.; Model Brick Co., Canton, O.; Oakland Pressed Brick Co., Zanesville, O.; Parker-Russell Mining & Mfg. Co., St. Louis, Mo.; Geo. T. Dickover, Wilkes Barre, Pa.; Hanover Pressed Brick Co., Hanover, O.; Terre Haute Brick & Pipe Co., Terre Haute, Ind.; Golden Pressed Fire Brick Co., Golden, Colo.; Somers Brick Co., Bakersville, N. J.; Ohio Mining & Manufacturing Co., Shawnee, O.; Purington Paving Brick Co., Galesburg, Ill.; Johnsonburg Vitrified Brick Co., Johnsonburg, Pa.; Chandler Pressed Brick Co., Chandler, O. T.; The Athens Brick Co., Athens, O.; Garden City Co., Farmingdale, L. I.; Laclede Fire Brick Co., St. Louis, Mo.; Dover Fire Brick Co., Cleveland, O.

Some of these exhibits were extensive in variety and of superexcellence in quality and color. Several of these exhibitors had photographs of buildings in which their products were used showing to what advantages brick can be used in architectural construction.

EXHIBITING MACHINERY, BOILERS, KILNS AND BRICK YARD SUPPLIES.

The Milligan Hardware & Supply Co., East Liverpool, O., whose literature showed lines of hardware, mill and pottery supplies, electrical construction and brick cutting wires.

Main Belting Co., represented by H. J. Roth, showed samples of its Leviathan belting whose merits were set forth in a small pamphlet giving the statistics and testimonies as to the efficiency of its products.

The Dunn Continuous Kiln Co. had pamphlets and a fine colored picture showing the construction and advantages of the kiln. Two small shovels were silent witnesses of fuel economy.

Horton Manufacturing Co., Painesville, O., with catalogs illustrative of fire brick machinery, disintegrators, hoisting machines and center crank engines.

F. E. Swift, Washington, Ia., exhibited blue prints of his special grateless furnace, which is a considerable improvement on the old Swift slack coal coking table furnace.

Arthur Koppel, 6668 Broad St., New York City, showed a neat little model of tracks and cars on the Koppel system. The Koppel railway materials are placed in every part of the world.

The Wallace Manufacturing Co., Frankfort, Ind.—The "Wonder" brick machinery, pugmills, separators, dry pans, friction clutch pullies, etc.

Chicago Brick Machinery Co. has its special line of brick machinery, crushers, elevators, trucks, etc. Of course, John Moroney was there. Yes, he had the dry press with him.

Progress Pressed Brick & Machine Co., St. Louis, Mo.—Various lines of dry and semi-dry brick machinery.

E. M. Freese, Galion, O.—"Union" and "Mammoth" brick machinery, rotating automatic cutters for side-cut brick, etc.

A. M. & W. H. Wiles Co., Grassy Point, N. Y.—All classes of machinery, representing machines, brick molds and other brick yard supplies.

Stevenson Co., Wellsville, O.—Brick, sewer pipe and clay working machinery of all descriptions.

American Blower Co., Detroit, Mich., was represented and distributed literature on its blowers and A. B. C. waste heat driers.

C. A. Potts & Co., Indianapolis, Ind.—Clayworking machinery and brick yard supplies.

The "Queen" recording pyrometer, exhibited by Queen & Co., 1010 Chestnut St., Philadelphia, Pa.

Heine Safety Boiler Co., St. Louis, Mo.—Literature on the Heine boilers.

Standard Dry Kiln Co., Indianapolis, Ind.—Dry kilns.

Cling Surface Manufacturing Co., Buffalo, N. Y.—A myriad of pictures illustrating the remarkable effects of "cling-surface" on belts in motion.

Cleveland Elevator Bucket Co., Cleveland, O.—Exhibits of the elevator buckets, which it is claimed give 10 to 15 per cent more clay and 15,000 brick more a day than any other bucket.

The Bonnot Co., Canton, O.—Catalogs of clay machinery and all Bonnot products.

J. B. Crowell & Son, Walkill, N. Y.—Barrows and brick yard supplies.

Dunlap Manufacturing Co. urged the merits of the famous Dunlap screen. Mr. Dunlap distributed a beautiful card case souvenir. Several "Dunlap screen" sales were effected.

F. S. Heidenreich, Hedrick, Ia.—Drawings and descriptions of the "American" continuous kiln.

P. Youngren, Milwaukee, Wis.—Drawings and description of the Youngren continuous kiln.

B. E. Bechtel, Waterloo, Ont., had a very fine exhibit showing the method of operating his famous rapid hacking system. Everybody had a hand at trucking.

Scott Brick Car Co., Knoxville, Tenn.—Model of the Scott car system in operation. This was the subject of much interest.

The Battenfeld Manufacturing Co., Cleveland, O.—The well known "Dictator" brick molding and pressing machine. Mr. Battenfeld was kept hustling in exhibition work and served "Dictator" toothpicks to the guests at the banquet.

The Leader Mfg. Co., Decatur, Ill., represented by E. B. Johnson, distributed literature and "Leader" pencils and exhibited models of its brick machinery.

Illinois Supply & Construction Co., St. Louis, Mo., represented by W. P. Grath, distributed literature setting forth the merits of its brickmaking machinery, up and down draft and tunnel kilns and coking furnaces.

The Henry Martin Brick Machinery Co., Lancaster, Pa., advocated its lines of brick machinery, represses, screens, dry and wet pans and brick yard appliances.

The Cleveland Car Co. had a very fine exhibit of a number of its steel cars and turn-tables for which it is so well known.

Chambers Bros. Co., Philadelphia, Pa., had several representatives who set forth the merits of the Chambers products. Sure, Davis Brown was there as well. The company exhibited a double-deck steel-channel drier car and also several samples of brick made by their machinery, one of which was a fine specimen of round-cornered paving brick cut with the Chambers indenting cutter. Numbers of framed photographs illustrating other lines of the Chambers products were attractively hung on the walls of the exhibition room. Two orders were received for the Chambers automatic side cutter to which several improvements have been made. Several other sales were made.

The Ohio Ceramic Engineering Co. came well to the front with a splendid exhibit of cars amongst which were a single transfer car with pushing and braking device, and single and double deck and rack drier cars. A Richardson repress was also installed which was admired by the visitors.

The largest single exhibit was that of the Atlas Car & Mfg. Co., Cleveland, O. Down the center of the exhibition room streamed a line of rocker dump cars, W. and V shaped, and it was the delight of the brickmakers to tilt them from side to side and comment on the ease of their motion. The Atlas drier cars also elicited many encomiums.

The Williams Patent Crusher & Pulverizer Co., St. Louis, Mo., occupied a corner of the exhibition room with one of their shale crushers and also a wet and damp clay disintegrator. Mr. M. F. Williams was constantly the center of an interested audience while he discoursed on the merits of his machine.

Taplin, Rice & Co., Akron, O., represented by H. W. Wynn, exhibited a section of their new ball-bearing dry pans and distributed appropriate literature.

The Wellington Machinery Co., Wellington, O., represented by the portly Chris. McDermott, scattered "Quaker" and "Monarch" seeds and exhibited their brick barrows and trucks.

H. Brewer & Co., Tecumseh, Mich., advertised its various products through the genial personality of Chas. Burridge. The "Brewer" catalog was in resplendent evidence.

E. C. Tecktonius, Racine, Wis., showed attractive samples of his malleable iron hoop lugs and kiln bands.

The Fernholtz Brick Machinery Co., St. Louis, Mo., sent J. B. Beall as an able representative, who with model press, winning manner and an array of lead pencils and literature introduced himself into the assemblies of the elect.

Geo. T. Cox, of East Liverpool, O., was there with numerous samples of brick and tile cutting wires for end and side cut and automatic tables. George was on the "wire" all the time.

The "Crown" drier folks were in strong evidence and polished "Crown" business up extensively.

G. M. Fiske.

The newly elected president of the National Brick Manufacturers Association, G. M. Fiske, of Boston, has for many years been recognized as one of the leading clayworkers of the United States. He has been engaged in the manufacture of clay goods for some 30 years and was one of the pioneers of architectural terra cotta in this country. The products of the Boston Terra Cotta Co. can

G. M. FISKE.

be found in the largest buildings in the greater cities of our land. To Mr. Fiske belongs also the credit of being one of the first clayworkers to produce bricks of various colors, a feature recognized by architects of today as exceedingly valuable in effective decoration.

Mr. Fiske has been a member of the N. B. M. A. for many years and has been active at its meetings, while he has neglected no opportunity in or out of harness to forward the interests of the clayworking industries of this country. G. M. Fiske is the senior member of the firm of Fiske & Co., and is president of the Fiske Brick Co., a new corporation now building an extensive brick-making plant at Dover, N. H.

New Fire Clay Company.

The users of fire clay will be interested in the announcement that the Twin City Fire Clay Works, of Soldier, Carter County, Ky., which has been organized by W. A. Connolley, is now prepared to supply superior quality No. 1 and No. 2 clay and give prompt delivery. The company can mine and ship 100 tons per day.

Report of N. B. M. A. Committee on Resolutions.

The committee on resolutions, consisting of D. V. Purington, L. C. Moore, J. P. Cahoon, Charles Schultz, W. P. Blair, J. R. Copeland and W. P. Alsip, at the N. B. M. A. Convention, made its report in substance as follows:

Feeling mention was made of the loss the association had suffered in the death of Jesse Eastes, of Chicago, died Oct. 21, 1901, and S. S. Chisholm, of Chicago, died Nov. 27, 1901, and the resolutions recommended for adoption were:

That the bill now pending in the New Jersey Legislature for the creation and maintenance of the department of ceramics at the New Jersey State College for Agriculture and Mechanic Arts at New Brunswick be indorsed.

That the effort of persons representing some of the denominational institutions of Ohio to prevent the needed increase in the appropriation for the Ohio State University be condemned, and the work done by that institution, particularly in the School of Ceramics, indorsed.

That the president of the association was authorized to appoint a committee of five to confer with Dr. David T. Day, chief of the Department of Mines and Minerals of the Louisiana Purchase Exposition, and with other organizations for securing an exhibit of clayworking interests at the exposition that will be commensurate with the importance of the industry.

That the interests of both the makers and the users of paving brick would be promoted by having inspection of this product made at the works, and that a committee of three be appointed to confer with city authorities and engineering societies.

That the thanks of the association are due to ex-President W. H. Hunt, chairman of the entertainment committee; to H. C. Bradley, chairman of the general committee of arrangements; to C. B. Stowe, the "Napoleon of finance"; to W. D. Richardson, chairman of the badge committee; to S. A. Williams, chairman, and S. M. Duty, secretary, of the exhibit committee; and to Edward A. Roberts, the press committee, for the excellent manner in which all the convention arrangements were planned and executed.

That the thanks of the association be tendered to the firms which acted as hosts during the convention.

That particular attention be given by members to the address of President Hunt.

All of these resolutions were unanimously adopted, except that recommending the testing of paving brick at the works.

$200,000 Plant for Kansas.

The W. S. Dickey Clay Mfg. Co. will build during the coming year a $200,000 plant somewhere in southeastern Kansas. The exact location has not been selected, but it will be where the strongest flow of gas and the best brick shales are to be found together. Already a dozen sites are under consideration, and the plant will be built between Iola and the southern line of Kansas. The gas belt of southeastern Kansas is rich in brick shales. In many places in Montgomery Wilson, Neosho and Allen Counties the drills in search for gas pass through from 25 to 30 ft. of shale that can be made into fine brick and tile. The new plant will make vitrified paving brick, building brick, hollow brick for partition walls and drain and roofing tiles.

J. A. Bryan, Jr., of Burlington, N. C., is in the market for brick machinery for a plant with a capacity of 15,000 per day.

B. M. Nowlen and H. Garrett are going into the brick business together at St. Joseph, Mich., and will be in the market for brick machinery shortly. The prospects for the establishment of a successful plant are very good.

CORRESPONDENCE.

By reason of its large circulation "Brick" offers exceptional advantages for the exchange of information on practical subjects in which the clayworker is interested, and we urge our readers to avail themselves of the "Brick" correspondence columns, and lay their questions and troubles before their fellowworkers, some of whom are almost sure to know the best solutions for the problems. All answers which we can print will be paid for at our regular rates. Where the subject permits of it a sketch or drawing will often add greatly to the clearness of the answer.

TO PREVENT CRACKED BLOCKS.

Editor "Brick": I wish to answer the inquiry of B. H. R. appearing in your correspondence columns for February, 1902, page 107. The trouble is caused by the yoke or bracket in the machine holding the core in the die. This separates the clay, and it is not again sufficiently united to hold together in burning. The remedy would be to use a die with longer lip or projection, about two inches we think, would remedy the matter.

Yours truly,

Ravenna, O. M. B. Mishler.

WANTS WHITE GLAZE.

Editor "Brick": I am writing to you, hoping that you will be able to give me a recipe for white glaze for jugs. I am making jugs a specialty, and want to secure very good results. I have a very fine quality of clay. Very truly yours,

Holly Springs, Miss. P. S. Allison.

(We give here a couple of recipes which may prove suitable for this clay:

Frit: Parts—
6 Stone.
2 Nitre.
12 Borax.
4 Flint.
2 Pearl ash.

To Mill—
24 Frit.
15 1-2 Stone.
6 1-2 Flint.
31 of white lead.

Hard Glaze: Parts:—
13 White lead.
10 Flint Glass.
18 Felspar.
3 Stone.
1 1-2 Whiting.

The ingredients can be procured from any reliable supply house.—Ed.)

IN RE CONTINUOUS KILNS.

Editor "Brick": I have read the very timely article in "Continuous Kilns," by Arthur E. Brown, B. Sc., in your January number, page 38, with much interest. While the theory of continuous burning is of course very well known here, the practical details of its application are not. In this connection I would greatly appreciate an explanation of the difference between the statement by the author on page 41, that "under properly arranged conditions the speed usually attained is from 10 to 11 lineal feet per 24 hours in kilns of moderate size," and the speed given by the following authorities in their works:

Lefevre, "Ceramiques du Batiment": Fire advances 4 to 8 meters per 24 hours.

Dr. Zwick, "Ziegelthone": Fire advances 6 to 9 meters per 24 hours.

Dr. E. Teuschner, "Ziegelei Kalender": Fire advances 6 to 10 meters per 24 hours.

You will note the speed of fire according to the French and German writers is materially greater than that given by Mr. Brown. This matter is so important in determining the size of kilns, that I venture to ask you for further information. Also is the inference correct that the fire will advance faster in kilns of larger cross section than in smaller ones? Yours truly,

Chas. G. Edwards, Assistant Engineer,
Electrical Commission of Baltimore City.

Editor "Brick": I am in receipt of a copy of the foregoing letter from Mr. Edwards, with reference to the speed of burning in a Hoffman kiln. You will note that I have stated in the article in question that the speed given is that attained under properly arranged conditions in usual practice. This speed corresponds pretty closely with what I have been told in the course of my visits to a large number of works in England and on the Continent. One may take it that usually with a kiln whose chambers are 15 ft. wide and 15 ft. long the usual output is 4 1-2 chambers per week. I have seen kilns in France in which the setting is extremely close, in consequence of high temperature being necessary, so that although the chambers were not more than 12 ft. long, the output was only 4 chambers per week. On the other hand, the greatest speed I have encountered with very free setting and with bricks requiring but a very moderate temperature, has been 100 lineal feet per week. The somewhat unreasonable figures given by the authorities mentioned may be appreciated if one considers that the usual length of the Hoffman kiln internally ranges between 90 ft. and 120 ft. If now the fire advances at the rate of 10 meters every 24 hours this would give a length of 70 meters per week or 231 ft. It can be readily understood that this is a physical impossibility, for even with kilns which burn at the rate of half their total length of chamber per week, the bricks when drawn are so hot that it is almost impossible to get men to handle them.

Herr Otto Bock of Berlin has recently perfected a form of Hoffman kiln without arch, of which I shall give some description later on. This kiln is stated by him to burn at the rate of about 30 meters per week, and is a type of kiln which is calculated to burn at the highest speed attainable.

The actual practical experience on this point is that small kilns will burn more quickly than large ones, but of course this depends entirely on the design of the kiln in regard to height of arch, volume of chamber per feed hole, and arrangements for the draft. Theoretically a large kiln should burn more quickly because there is less surface in comparison with the contents for loss of heat by radiation. No doubt the matter depends also to some extent on the burners, for in a large Hoffman kiln the operation of feeding so many holes is such a continuous one that if the kiln were worked at its highest speed the burner would scarcely be able to cope with the work. I have never heard of two burners being employed at one time in order to get over this difficulty. I have frequently been told that the burner has scarcely finished feeding all the holes in the firing chambers before he has to begin again.

Very truly yours,

Arthur E. Brown.

THE GOOD ROADS TRAIN.

Editor "Brick": You know already of the remarkable success of the train which ran over the Illinois Central R. R. last spring and summer from New Orleans north, in the Mississippi Valley, through the states of Louisiana, Mississippi, Tennessee, Kentucky and southern Illinois. We had a great International Congress at

Buffalo from the 16th to the 21st of December, and were very much gratified by the good reports which came to us from the Mississippi Valley, where we had built so many object-lesson roads. The governor of Mississippi made a speech, in which he said that his state had never been so thoroughly aroused upon the road question at any time during its history as during the visit of the Good Roads Train; and he also said that the work so well begun at that time was going on with great rapidity in all parts of the state. We have similar reports from all the other places that we visited.

On October 29th the train which had been on exhibition at the Buffalo Exposition started for a new itinerary through the southeast, over the Southern Ry., going from Washington to Winston-Salem, from Winston-Salem to Asheville, from Asheville to Greenville, and from Greenville to Birmingham, thence to Mobile, from Mobile to Montgomery, and from Montgomery to Greenville, S. C., at which place we suspended operations for the holidays.

At each of the places visited we built an object lesson road, demonstrating the advantages of economical methods and scientific processes. We also held a convention lasting two days in each place, where every phase of the question was considered and discussed. We found the people in this section exceedingly eager to obtain information, and very enterprising in applying it to the good roads problem in each vicinity. There is no place in the United States that I have visited where the people are more intelligent and progressive along this line than the southern people whom we visited on this trip.

On January 13th we started the train again at Columbia, Ga., where we had a very successful two days' convention and built an object lesson road, as usual. We left there last Saturday noon and arrived at Augusta Monday morning at 10 o'clock, being almost two days on the road, though the distance covered is not more than 250 miles. This is explained by a peculiarity in the laws of Georgia, which is very uncommon, but which forbids the running of any trains except passenger trains on Sunday. This is intended to make the people better, but it made us worse!

From here we shall go to Columbia, the capital of South Carolina, and from there to Charleston, and give an exhibition at the Exposition.

In all this great extent of territory we find the most diverse conditions prevailing. The one substance which is most common of all is clay; whenever we can make a good road out of clay we will have solved the road question; and I am pleased to note that experiments along the line of burnt clay for country roads are demonstrating that there are greater possibilities along that line than most of us had supposed. Your work being so intimately connected with clay, I hope will lead you to make an investigation of its suitability for country roads without the necessity of having it in the form of brick.

Martin Dodge,
Director, Office of Public Roads Inquiries, U. S. Department of Agriculture.

Wanted—A Remedy for This Trouble.

We have trouble with our brick, soft mud, made from strong, black clay, which burns red. We mix about 20 per cent sand with it and it shrinks about ¾ in. in 9 in. in drying and burning, but we find that right above the jet or overhanger top of arch that for four or five courses the brick will have no sound or ring and will break very easily. We burn in common up-draft kilns. Is the trouble on account of letting air in the kiln where we clean the fires, or do we want to put more sand in the brick? How much sand will a very strong clay bear? We set our brick the common way, three on three on top of arches. Would be obliged if you would suggest a remedy. Truly yours.

New Jersey. M. T.

Pacific Coast Letter.

The brick yards and factories of the Pacific Slope are now preparing for the new season. Many of the smaller yards of California and the neighboring states which have been closed for the winter season will begin work by the first of March. Some very important developments in brick manufacturing are under way on the coast in response to the unprecedented activity in the building of brick and fire-proof buildings. This is especially true in the Northwest and in the Southwest. In San Francisco the chief interest of the trade centers in the expiration by time-limit of the present brick pool on March 31st. The pool has been in existence since the revival of building in 1900. It includes about ten of the leading brick yards of the San Francisco Bay district, and has during its existence, held the price of ordinary building bricks at a minimum figure of $10 per thousand. During the last year a number of outside concerns have invaded the field of the combine and this together with the rumors of new brick factories to be established in the neighborhood is said to have caused some apprehensions by members of the combine. It is reported that one of the largest factories hopes to hold the combination together until midsummer and threatens in the event of a dissolution of the pool and a break in prices to cut at once to $6 per thousand.

On Feb. 7th ground was broken for the new brick and clay plant of the Great Northern Clay Co. near Ballard, Wash. This company was incorporated the week previous with a capital of $500,000. The officers are Robert Nesbit, president and treasurer, and J. Gobeaux, secretary and superintendent. Mr. Nesbit, a capitalist from the Klondike, is financing the new company. The new plant will be located on the line of the Great Northern Railroad and will have shipping facilities both by water and by rail. A tract of 30 acres embracing what is claimed to be one of the finest clay-banks in the west has been secured. Arrangements have been made to build a spur from the railroad directly into the yard. The intention is to manufacture common brick, tile, paving and sidewalk brick, ornamental brick, hollow brick, sewer pipe and other clay products. Mr. Nesbit states that the plant will be ready to put brick on the market in May. The buildings and equipment for the plant to be immediately erected will cost about $50,000. Of this $20,000 will go for machinery. The latter has been ordered from the C. W. Raymond Co., of Dayton, O., through Archibald & Ballou, of Seattle, Wash. Six carloads are now on the way from Dayton. The plant will have a capacity of about 60,000 brick per day. The drier will be of the Sharer hot-air pattern and will be 50x125 ft. in dimensions. The machine house will be 40x80 ft., the boiler and engine house 20x40 ft., and the pressure room 20x25 ft. A proposition to add a Dunn continuous kiln is now being considered. Mr. Nesbit states that in the end he intends to make the plant the largest brick-making establishment on the coast.

Gladding, McBean & Co., of San Francisco, have just closed a contract with Mrs. Jane L. Stanford, for the tile work and other materials for the mechanical engineering laboratory at the Leland Stanford, Jr., University. The contract price for the work is $5,500.

H. A. Murphy, general manager of the Stockton Brick & Pottery Co. and the California Cement & Lime Co., has now returned from his eastern trip, where he has been for the purpose of purchasing machinery for his companies. He is at present located at the works at Tesla, Cal., but expects to establish offices in San Francisco in the course of time.

Joseph G. Lee, secretary and treasurer of the Knowles, Taylor & Knowles Co., manufacturer of artistic pottery and chinaware at East Liverpool, O., is now in Los Angeles, Cal., with his family. He will remain in Southern California for some time.

T. L. Myers, Arizona representative of the American Clay

Working Machine Co., of Bucyrus, O., has just installed the extensive brickmaking plant of the Benson (Ariz.) Brickmaking Co. He reports that the first kiln burned has been opened, is entirely satisfactory and is now ready for delivery.

Earnest & Wilson, owners of the Alaska marble quarry, near Valley, Wash., are preparing to erect a tile manufacturing plant at Spokane, Washington, making mosaic and Florentine tile. H. J. Earnest, senior member of the firm, is now in the east purchasing the machinery for the plant. The intention is to have a plant capable of turning out five thousand 10-in. tiles per day, in operation by the first of April.

The big Aguas Calientes brick plant at Aguas Calientes, Mexico, has begun operations, and it is claimed that the first output shows that the clay of that section makes a good quality of brick. The city authorities of Aguas Calientes are now urging the establishment of 10-ft. foot brick sidewalks along the streets. As an inducement to property owners on certain streets, those who put in sidewalk improvements during the coming year will be exempted from taxation during a period of ten years.

W. N. Lewis, of Corona, Cal., and E. N. Lewis, of Elsinore, Cal., have formed a partnership for the purpose of manufacturing plain and pressed building brick at Corona. They have leased two acres of land near that place and are arranging to put up a $10,000 plant. Kilns with a capacity of 200,000 bricks each will be installed. Oil will be used as fuel. Lewis Brothers have already received orders for more than half a million bricks.

V. Holz & Son, of Grangeville, Idaho, are now installing their machinery at the new plant north of town. It is expected that the plant will be ready for operations about June first. It will have a capacity of 40,000 bricks per day. Mr. Holz estimates that the factory will turn out 500,000 bricks during the coming season.

The Westminster Tile factory, owned and operated by J. B. Blaine & Son, at Santa Ana, Cal., resumed work for the season January 25th. The owners are contemplating putting in another kiln for the making of fire brick.

At the regular annual meeting of the Honolulu Clay Co., Ltd., held in Honolulu, January 22nd, the following officers were elected to serve for the ensuing year President, Frank Hustace; vice-president, H. L. Kerr; secretary, F. J. Amweg; treasurer, F. J. Lowrey; auditor, P. M. Landsdale; director, R. W. Castle, sr.

The Whittier Brick Co., composed of J. C. Hiatt, J. H. Linkletter, T. F. Hensley and John Cole, has been organized and will engage in the brick-making business at Whittier, Cal. A trial kiln of 100,000 bricks will be burned as soon as possible in order to test the clay.

Machinery is now being installed in the new brick factory of the Renton Clay Works at Renton, Wash. Several contracts for red pressed brick have already been signed by this company for delivery within 120 days.

The Reno Pressed Brick Co., of Reno, Nev., is now excavating for a nest of three permanent kilns. The works which will be opened as soon as the ground thaws will be run on an extensive scale during the coming season. Orders for future delivery are already coming in.

The city authorities of Los Angeles, Cal., are still struggling with the brickyard question. On January 27th the Simons Brick Co. and the Los Angeles Brick Co. were granted the desired permits; the application of C. L. Berg was denied. Henry C. Jensen has applied for a permit to operate a brick yard on West Washington street. Joseph C. Hadacheck and Earnest Jensen have asked for permission to establish a kiln in the Matthews subdivision.

The Ashton Firebrick & Tile Co., of Salt Lake, Utah, has been incorporated with a capital stock of $25,000. The company will manufacture and sell fire brick, tiles, sewer pipe and crucibles. The officers are: E. T. Ashton, president; George M. Cannon, vice-president; Nephi L. Morris, secretary and treasurer.

St. Louis Letter.

The severe weather for the past few weeks has somewhat interfered with the brick and other clay industries, but there is every prospect for better weather, and then business will take a start and improve.

Most of the brick yards shut down about the first of the year for improvements and overhauling, and still remain closed. Some yards, however, that were short on brick, have started up and have tried to do what they could. Among them were the Union, which has already got out two kilns since work commenced.

The North Alton brick plant, which closed when the others did, has also resumed, and will be run steadily during the remainder of the year. While idle, the plant was improved and now has a much larger capacity.

Prices remain the same as when last reported, but with the opening of spring there will probably be a slight advance. Prices as quoted today are as follows: Mercantile brick, $7.25; ordinary brick, $7.75; strictly hard brick, $8.25; red pressed brick, $17.50; sidewalk and paving brick, $8.50.

The annual election of directors for the St. Louis Hydraulic Press Brick Co., held this month, resulted in the selection of the following: Festus J. Wade, E. C. Sterling, H. W. Elliot, W. E. Smith, Henry C. Scott, John A. Holmes and William B. Dean. The directors organized by electing Mr. Sterling president and Mr. Elliot secretary and treasurer.

The Illinois Car Service Co. was defeated in a justice court in Alton last week, in an effort to enforce demurrage charges against the Alton Paving, Building & Fire Brick Co. on two cars of brick.

The Laclede Fire Brick Manufacturing Co. is putting up an addition to its factory on East Sulphur Ave., between Wilson Ave. and the San Francisco railroad tracks, at a cost of about $4,000.

The contractor who is building the new city hospital has had some trouble recently with the building commissioner regarding the terra cotta which he desired to use. The building commissioner objected to the color of the terra cotta, but on appeal to the president of the board of public improvements the terra cotta was accepted.

The St. Louis Sewer Commissioner estimates that more than $1,250,000 will be spent on sewers this year if his plans are carried out. This will create a very big demand for brick and will furnish steady employment to not less than 500 men. It is proposed to build in time for the Worlds Fair, sewers in the district immediately adjoining the Fair site and to complete the main sewers in the other sections of the city. The Cabanne sewer, with district sewer connections, will cost $620,000. The drainage of the Parkview tract, adjoining the site, will take district sewers costing $150,000. In the territory lying between Union and Belt Aves., north of the Fair site, $30,000 will be required for district sewers. In Clarendon Ave. district $165,000 will be required for district and lateral sewers. The Tylar tract joint district sewers will cost $80,000 and the district and lateral branches $400,000. The completion of the Tower Grove storm sewer will cost $140,000 and the Stein St. sewer will cost $30,000. The Arsenal joint district is estimated at $140,000. All this work is expected to be finished by December 15th.

There is a temporary suspension of work at the yards of the St. Louis Press Brick works, at Glen Carbon, Ills., owing to the fact that the company and the brickmakers' union have not agreed upon a scale of wages for the year, the former contract having expired on February 1st.

The Hydraulic Press Brick Co. has purchased about 50 acres of land at Emerson station, on the Creve Coeur Lake branch of the Missouri Pacific railroad, for $15,600.

It is pointed out that the number of building permits issued in St. Louis for January is far behind that of Chicago 14 months before the opening of the Columbian Exposition. During the month of January the estimated cost of buildings for which permits were issued in St. Louis was only $735,453, while in Chicago, with no

especial boom in prospect, the building permits aggregated $3,549,450.

The Coffeyville, Kansas, Vitrified Brick & Tile Company, Chanute, Kan., has bought the plant of the Chanute Vitrified Brick & Clay Manufacturing Co. The new owners contemplate increasing the daily output of the plant from 50,000 brick to 100,000 by putting on a night force. The purchase includes 170 acres and the price paid was $54,850.

Extension to H. W. Caldwell Plant.

Some time ago we published a brief description of the new plant of the H. W. Caldwell & Son. Co., of Chicago, which, though very

NEW PLANT OF H. W. CALDWELL & SONS CO.

extensive, has been found too small to accommodate the growing business of the company, and further additions have been recently made. The illustration shows the plant as enlarged.

The main machine shop building is 100x180 ft., with galleries running its full length, which, by means of an electric crane, are utilized for manufacturing purposes as conveniently as the main floor. This building is used entirely for manufacturing, all of the raw material and manufactured stock being carried in the warehouse hereafter described. By utilizing this entire building for machine work, the capacity of production is much greater than would be the case if stock were carried In this building is a complete equipment of modern machine tools, all of them being driven electrically and all being arranged for the convenient handling of the material to be operated upon.

Next to the machine shop building and of the same dimensions is the building devoted to the manufacture of the well-known specialty of the Caldwell company, the Caldwell helicoid conveyor, and the growing line of sheet metal specialties. This building is fully equipped with furnaces, the oil being used for fuel, and every device for the economical and workmanlike production of sheet metal articles is to be found therein. Among the recent additions to the plant is a complete pneumatic tool equipment, by means of which the rivetting, chipping and some of the drilling is done. The use of compressed air in this work insures economy and rapidity of production.

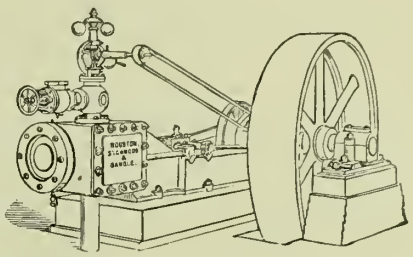
The power house, which is shown back of the main machine shop, is an independent structure, equipped with electrical machinery and air compressors, for supplying air pressure for the fuel oil piping.

The most important addition to the plant is a large warehouse, which has three stories and basement, with about 45,000 sq. ft. of floor space. The building is equipped with two elevators, and is used for the storage of the large stock of goods that the Caldwell company always carries on hand. With ample space for shipping purposes, the handling of orders with facility and dispatch is attained. The general arrangement of the plant is such that the raw material is received in one department and moves through its different stages of production until it finally reaches the shipping room, ready for delivery.

The additions to the plant just completed double its capacity and with the increased capacity the Caldwell company is prepared to take care of a growing trade with even greater dispatch than has been their custom heretofore.

H-S-G Engines.

The accompanying illustration shows the "Standard" slide valve steam engine with separate outboard bearing made by the Houston, Stanwood & Gamble Co., of Cincinnati. This company has exten-



sive works in Covington, Ky., and has devoted a great deal of attention to the development of a slide valve engine, which in addition to having the merit of low cost shall be as economical of steam as is possible with that type.

Sang C. Reck, secretary and treasurer of the Alliance (Neb.) Pressed Brick Co., writes us that this company is installing machinery for a two-mold dry press system, which will take the place of the old hand yard. The new plant will be ready for operation by April 1st. Mr. Reck says in conclusion: "I have plenty of brick on hand most of the time, but must have the "Brick" you sell all the time."

Trade Notes.

The use of "Cling Surface" is extending among the plants, and it is evidently giving satisfaction, as is evidenced by the following reports: Manown Mfg. Co., Manown, Pa.: "We are using cling-surface in our belts with good results." Columbus Face Brick Co., Shawnee, O.: "Your cling-surface is all right."

The Means Foundry & Machine Co., of Steubenville, O., the well-known manufacturer of clay grinding pans, sewer pipe presses and general repairs for brick and pipe plants, has gladdened the hearts of its friends with a leather bound desk calendar for 1902 and 1903, which we find welcome and useful. The company even in such details is, it will be observed, pursuing its usual policy of looking a long way ahead.

The Reese-Hammond Fire Brick Co., of Bolivar, Pa., has issued a neat calendar, with an illustration presumably of one of their representatives on the war path seeking orders for fire brick. If personality has anything to do with it, we should imagine that the gentleman portrayed is a very capable and powerful representative.

J. C. Steele & Sons, Statesville, N. C., makers of the "New South" brick machinery, report that they are receiving orders every day

coming from all sections of the south. From present indications they expect to do by far the largest business they have ever done. They have recently placed outfits in Bristol, Tenn., Pollard, Ala., Blakeley, Ga., and are shipping outfits to Starrsville, Ga., Athens, Ga., Conway, S. C., and automatic cutters to Lake Charles, La., Concord, N. C., Rock Hill, S. C., and Lake City, Fla.; also recently shipped a car load of double deck drier cars to Castleberry, Ala.

The Ross Keller Brick Machine Co., of St. Louis, has been doing a very large business during the past few months. More territory has been covered than at any previous time of the company's existence with the most satisfactory results. Some of the most recent sales are as follows: One six-mold machine and complete outfit to the Rusk Brick Manufacturing Co., Rusk, Tex.; one six-mold machine and complete outfit to A. J. Zicker & Co., Austin, Tex., and two six-mold machines with complete outfit to the Chactaw Pressed Brick Co., South McAllister, I. T. The latter plant will be one of the largest and finest installations in the southwest. Many other orders are on hand and the company has work enough in sight to keep the works running full time for many months to come.

The Ceramic Review is a special technical journal for the clayworking, glass and cement industries of Russia. Several issues have now been produced, all of good appearance and high character. The ceramic industries of Russia have for a long time been existing only in a germinal state, but during the past ten years there has been considerable progress made in their development largely due to the discovery of large quantities of raw material. Much American machinery has been introduced in Russia and we look forward to considerable extension in the knowledge and practice of Russian clayworking during the next decade. The first number was issued in July, 1901, and our readers can obtain copies of the journal by application to the Ceramic Review, Nikolajew Phalejewskaja No. 10, Russia, Government of Cherson.

The Ohio Steam Pump Company, Canton, Ohio, have favored us with a copy of an exceedingly unique and handsome circular illustrating and describing its automatic feed pumps and receivers. The company reports an excellent sale for these machines to brick and clayworking plants, which is the direct result of the satisfaction users are receiving from them, this being evidenced by the following, which is a copy of a letter they have just received from a customer: "Relative to the merits of the automatic feed pump and receiver purchased from you, we beg to advise that it is working in a very satisfactory manner. The automatic feature, we consider a complete success. The saving in fuel since we have installed this pump (January 1st) has more than paid its cost.—The Minerva Paving Brick Co., A. L. Curry, secretary and treasurer.

The United States Brick Press Co., and Globe Iron Foundry Co., of Erie, Pa., are mailing to their customers an illustrated changing puzzle, which is both ingenious and amusing. A handsome and amorous gallant is about to cull Cupid's nectar of delight from the lips of his inamorata. By pulling at a small tongue on the bottom of the puzzle the scene is rapidly changed and in the place of the girl of his choice the gallant finds his lips on the face of a negress of elephantine proportions and countenance of darkest ebony. No such disappointment waits the users of the machinery made by the U. S. Brick Press Co., and Globe Iron Foundry Co., whose lines of dry and soft mud presses, pulverizers, dry pans, engines and boilers are yielding satisfactory service in all parts of the states. Two two-cent stamps will bring to the curious this amusing puzzle and literature concerning the products of these companies.

The Iowa State College, at Ames, Ia., is issuing a very handsome souvenir descriptive of the college, beautifully illustrated by half-tones and giving the reader in an attractive way an excellent comprehensive view of the numerous resources of this college. The book is interspersed with many apt sayings from well-known authors, which add immensely to its reading attractiveness. It is only by perusal of such a work as this that the ordinary citizen can get even a faint idea of the immense benefits conferred upon a state and its citizens by the erection and maintenance of such an institution. Copies of this souvenir can be obtained upon application to Prof. S. W. Beyer. An excellent quotation from Garfield appears on the first page, which is well worth being borne in mind by our readers and is especially applicable to clayworkers: "Things do not turn up in this world until somebody turns them up."

The Burt Manufacturing Co., of Akron, O., reports busy times with its London agency, having made an important shipment of "Cross" oil filters and Burt exhaust heads there last month. These two American devices will do their share to help the British manufacturer solve his present problem of lessening cost of production, as both of them have money-saving as their prime advantage.

The H. W. Caldwell & Son Co., Chicago, has recently opened a sales and engineering office in New York city, at Room 410 No. 95 Liberty street. This office is in charge of Mr. R T. Pearce, mechanical engineer, and it is the intention of the Caldwell company to give the eastern trade personal attention through this office. Through its extensive acquaintance with the special line of elevating, conveying and power transmitting machinery, the company will no doubt be able to render efficient engineering assistance to any one interested in this line of machinery.

The Buckeye Boiler Skimmer Co., of Cleveland, O., has issued a catalog on "Boiler Scale and Its Prevention," describing the method of cleaning steam boilers with this company's automatic boiler cleaner. The device consists of a floating skimmer, which is a wide-mouthed funnel suspended by a tubular arm, through which impurities pass from the surface of the water to a settling chamber. The skimmer is always submerged the same depth, irrespective of the height of the water in the boiler, by means of floats, thus keeping the funnel at the point where the greatest amount of scum will be collected. The water and scum is discharged into a receiving chamber between the top head of the precipitator and the head of the inner tube which it contains. The incoming water is cooled a few degrees, and passes downward between the inner tube and the main shell until it reaches the lower end of the tube, when it changes its direction and flows downward, while the sediment separates from it and continues to settle and is collected in

the steam chamber below. As long as the boiler is making steam a continual circulation is kept up through the skimmer and precipitator, and the process of purification is continuing.

The Under-Feed Stoker Co. of America, which manufactures the Jones under-feed stokers, has recently closed a number of excellent contracts, among which the following may be mentioned: Twin City Rapid Transit Co., Minneapolis, Minn.; Amoskeag Manufacturing Co., Manchester, N. H.; Cund Brewing Co., Cleveland, O.; Van Camp Packing Co., Indianapolis, Ind.; Theodore Hamm Brewing Co., St. Paul, Minn.; Reed House, Chattanooga, Tenn.; Stephens Bldg., Detroit, Mich. The contract with the Twin City company calls for the equipment of boilers in its new power house now in the course of erection which is among the numerous improvements now being undertaken by that company at an outlay of 1,250,000. The plant of the Amoskeag Manufacturing Co. is operated by a battery of Manning boilers under which these stokers will be used. Mr. W. H. Van Sickle, formerly connected with the Chicago office of this company, has recently assumed charge of the company's New York office, 1011 Singer Bldg., Broadway, New York.

The Wellington Machine Co., Wellington, O., has issued its 23d annual catalog. This illustrates extensively and describes in detail the many well-known machines of the company, which are used in the soft-mud process, now to be found in use almost everywhere in the United States. It is highly gratifying to the Wellington people to note the increase of their foreign business, the "Monarch" machine having won special favor abroad. The "Big No. 6 Monarch" brick machine is the latest of the company's products. Its capacity is from 40,000 to 50,000 large brick per day. It has two pugmills, each 7 ft. in length, larger in diameter than the No. 1 and No. 5 styles, increasing the clayworking capacity one-fourth. The presses consist of heavy wings cast on 4-in. steel shafts. Their movement is oscillating. The front tempering shaft is directly over and parallel with the press and runs three revolutions to each mold of brick. The company issues a special guarantee against breakage, and claim that for simplicity, rigidity and longevity, the Wellington machinery is unsurpassed. In the catalog many valuable testimonials are printed, all contributing praises and expressions of satisfaction at the results attained. The "Quaker" machines are also illustrated and described and the crushers and disintegraters of the company are commented upon at length. The outlook for 1902 is exceptionally brilliant, and the company reports more business done during the past year than at any previous year in its existence.

The Stevenson Co., of Wellsville, O., builder of the well-known Stevenson wet and dry pans and general brick and sewer pipe machinery, reports that notwithstanding the business done by it in 1901 was the heaviest in its history, 1902 gives promise of still greater things, for in the first five weeks of the year orders were booked for a round dozen of its latest improved 9-ft. dry pans, in the face of the keenest competition. There is also assurance of as many more in the next 30 or 60 days. Scarcely a day passes without one or more inquiries from prospective purchasers of new brickmaking or sewer pipe outfits, and orders for new work and late improvements are received with every mail. In January and the first week of February the company furnished the American Sewer Pipe Co. four of the latest type 9-ft. dry pans for the National Works at Barberton, O., displacing an equal number of another make, in addition to quite a large order of other improved machinery for these works.

There has just been completed for the St. Mary's Sewer Pipe Co., of St. Mary's, Pa., what is confidently declared by the manager, D. B. Anderson, to be the most complete and modern sewer pipe factory in America, or in the world. This has been in operation since February 1st. At the same place the Stevenson Co. is erecting a new brick works for the Elk Fire Brick Co., under the management of W. S. Ravenscroft, and will have it in operation in about ten days or two weeks. A second 9-ft. pan has just been installed in the Boyd Brick Co.'s works at that place. Orders are in hand for equipment of works at Elwood City, Monongahela City and two at Washington, Pa. This will make three plants equipped by the Stevenson Co. at Washington inside of a year.

At Buckeyetown, Md., it equipped a big brick plant for C. F. Thomas & Son last season, and this plant will be enlarged, the Stevenson Co. having an order for another 9-ft. dry pan. Other installations include two 9-ft. dry pans for O. W. Weyer's plant at Buffalo, put in last fall; a pan for F. W. Haake & Son., of Buafflo; a repeat order for wet and dry pans and presses for the East Ohio Sewer Pipe Co.; a 9-ft. dry pan for the Vulcan Clay Co., Wellsville; a 9-ft. pan for the Champion Brick Co., which has abandoned its site below Wellsville and removed to a new site above the town; a 9-ft. pan for the Kanawha & New River Fire Brick Co., Charleston, W. Va. The company's success is of course chiefly due to the quality of its machinery and promptness in filling orders, though the personality of the general manager and salesman, C. Stevenson, is also important. Mr. Stevenson has a thorough knowledge of the business and he spares neither pains nor expense in acquainting himself with the needs of prospective builders and assisting them in effecting the best solutions of the problems confronting them.

BRICK

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We want our readers to feel always that BRICK is their paper, and that what interests them interests its publishers and subscribers. We will therefore appreciate most highly any communications, questions, experiences or suggestions, or marked copies of local papers containing items of news pertaining to the interests of clayworking.

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Chicago capitalists project a new brick works at Peoria, Ill.

A new brick plant will be erected at Johnson City, Tenn., at a cost of $40,000.

The citizens of Freeport, Ill., have chosen brick in preference to asphalt for paving that city's streets.

The Washington Brick, Lime & Manufacturing Co., of Spokane, Wash., will install a new brick plant in British Columbia.

H. Wiley, proprietor of the pressed brick works of Chanute, Kan., contemplates removing that manufactory to Topeka.

The Sheboygan (Wis.) Brick & Tile Co. has received a new brick machine which more than doubles the capacity of the plant.

The Diamond Firebrick Co., Colorado Springs, Col., has completed a new down-draft flue and other improvements at its works.

Edward Perkins, a prominent brickmaker of South Bend, Ind., has purchased a 40-acre site for additional yards near Mishawaka.

The Kelderhouse brickyards at Hamburg, N. Y., which were shut down recently on account of the severe weather, will reopen in April.

T. B. Williams, part owner and manager of the Colfax (W. Va.) Red Brick Co., has disposed of his interest to J. V. Fulton and J. P. Conn, of Uniontown.

Albert and William Kahl, of Colorado City, Col., propose building a new brick plant with a capacity of 30,000 brick per day. So soon as a site shall be selected work will be begun on the erection of a structure 40 x 55 ft. in dimensions. The plant will run 24 hours per day, employing three shifts of operatives.

The Lordsburg, Cal., Brick & Construction Co., is still continuing operations at its brickyard. The brick of this company is finding ready sale in various parts of southern California.

Walter L. Robertson has purchased the interest of his father, S. Robertson, in the Robertson Brick Co., of Birmingham, Ala., and will continue operations as proprietor and manager of the plant.

The Meyers Clay Manufacturing Co., of Toronto, O., capitalized at $100,000, has been granted a charter. W. F., J. W. and G. M. Meyers, of Toronto, and George T. Heppenstall, of Pittsburg, are incorporators.

W. L. McCarel and J. V. Ayer are about to begin the erection of one of the largest clay factories in the state at Brazil, Ind. These promoters have developed other clay industries in Indiana which at present give employment to 1,000 persons.

The Alhambra Brick Works of Chicago has been progressing rapidly of late in the manufacture of fine products. It is erecting an additional building 40 ft. in length, which will be equipped with everything necessary for the successful production of the high grade wares of the company.

Joseph Hadachack and Ernest Jensen, brick manufacturers of Los Angeles, Cal., have secured a temporary injunction to restrain the Los Angeles Pacific Railroad Co. from running a cross-cut road through their property. It is alleged that the company is now laying the new track and that unless the restraining order is made the plaintiffs will suffer damage.

Clippert, Spaulding & Co., Lansing, Mich., has been incorporated with a capital stock of $30,000 to succeed the well-known brickmaking firm of Clippert & Spaulding. The officers of the new company are: O. E. Spaulding, president; George C. Clippert, vice president and manager, and A. C. Bird, secretary and treasurer. It is proposed to increase the out put of the old plant to 8,000,000 brick per year.

The Southern Brick Manufacturers Association, comprising Georgia and Alabama brickmakers, was organized at Atlanta, Ga., February 6th, and the following officers elected: E. L. Wight, of Albany, Ga., president; H. H. McClure, of Rome, Ga., and E. A. Copeland, of Birmingham, Ala., vice-presidents; and H. L. English, of Atlanta, secretary and treasurer. A resolution was passed inviting brick manufacturers of Florida and Tennessee to membership in the association.

The Great Northern Clay Co. broke ground for its new plant near Ballard, Wash., on February 7th. The buildings and equipment are estimated to cost about $50,000, and the product will comprise building, hollow, paving and sidewalk brick, tile and other clay manufactures. Machinery has been ordered of the C. W. Raymond Co., Dayton, O. Robert Nesbit is president and treasurer of the Great Northern company and J. Gobeaux, secretary and superintendent, both of Ballard.

The building boom in Everett, Wash., is calling for an immense amount of brick from the brick yards at Seattle, Wash. During November nearly one million bricks were shipped from the Seattle yards to Everett. Local building in Seattle is also brisk and is calling for a continuous supply of brick. There is now some talk that the price of brick may be again raised to $10 per thousand. It will be remembered that the price was reduced to $9 some months ago. Brick men estimate that Seattle's output of brick will reach thirty million during 1902.

Briquettes from Peat.

Some time ago we published several articles on the possibilities of peat as a future fuel for the brickmaker, and quite recently we mentioned the work done by Mr. E. Stauber, of Berlin, in the direction of making efficient machinery for the production of peat briquettes. The unrelenting policy of the German coal producing syndicates has caused great interest to be taken in fuel matters by the German people, who are suffering from the restricted output and the high price of coal. The recent American consular reports reveal to us that the turf or peat beds of the German Empire cover an area of 4,942,000 acres, and that nation is just beginning to realize the vast store of heat-producing material which has lain for so long undisturbed and practically ignored. During the last 12 years great progress has been made in the manufacture and use of briquettes from brown coal or lignite, held together by a matrix of bitumen, either developed in the material itself by heating or added as a by-product of gas and coal manufacture. These briquettes are sold in Berlin at from $2 to $2.50 per M. They are clean to handle, make no smoke and kindle readily. The consumption of these briquettes for domestic fuel among the poorer classes in the German cities is enormous, but the area of brown coal is insignificant to the vast areas of peat available, and the problem hitherto has been to devise some inexpensive process by which peat could be deprived of its excess of water and converted into briquettes of sufficient heating power to replace the more costly material. This, Mr. Stauber has claimed to have done, and his products have been tested by and have received the endorsement of the Royal Chemical Testing Station, at Berlin. Briquettes made from turf by the Stauber method contain 45.14 per cent fixed carbon, 4.54 per cent hydrogen, 20.34 oxygen and 9.09 ash, and have a thermal value of 3,806 calories (6,850 British thermal units per pound). This equals the standard of any brown coal hitherto worked, and has an advantage over the brown coal in that it does not contain a percentage of sulphur and may therefore be used wherever charcoal is now employed.

The Stauber process for making peat consists of a series of specially devised machinery by which the crude turf is pulverized, fibers, roots and other impurities are eliminated and the water removed by compression to the proper proportion. After this the cleansed material is reduced to a uniform consistency and pressed into molds by another series of machines.

We take pleasure in quoting below a few extracts from a communication sent to us by Mr. Stauber, which will help further to give light upon the possibilities of peat manufacture.

All industries which have to deal with raw materials in a damp state, or which produce fabrics which require artificial drying before they can be disposed of, well know the great difficulties which they have to overcome, as almost all the known methods of artificial drying leave greatly to be desired, either on account of heavy expenses connected with such treatment, or because the substance to be dried undergoes a material change which deteriorates its value, or last, but not least, because the time employed for such drying is excessive.

By close study of the different drying processes hitherto in existence and guided by an experience of many years standing, E. Stauber, C. E., has invented a drying process for which he claims superiority over any existing treatment on account of efficiency of procedure, of speed and cheapness and that the materials to be dried undergo no change whatever as to quality or compound, with the exception of the abstraction of the liquid. The materials can be dried to any amount of moisture required.

The process, which does not require any costly complicated machinery, is founded on the physical law that water reaches boiling point at a low temperature when enclosed in a vacuum.

Of all damp substances, "raw peat" is about the most difficult to be dried, as the water it contains is enclosed in small capillary vessels, which must be caused to burst prior to any drying taking place. Mr. Stauber has fully succeeded in overcoming this difficulty and by producing a kind of peatcoal with 20 per cent water out of ordinary peat containing about 84 per cent water, without in the least changing its chemical combination or in any way adding to it, has solved a problem which is of the greatest importance to political economy. Districts which have hitherto been debarred from taking up industrial pursuits on account of want of fuel, but which own peat moors, will henceforward be able to successfully compete with territories favoured with large deposits of coal, all the more as Mr. Stauber has also invented a process by which peat coal —as peat dried by his system may justly be called—can be turned into coke at a comparatively small cost, such coke to be equal if not superior to the best coke produced from pit coal.

To prove the several advantages which are claimed for the Stauber drying process, the proceedings may be hereafter explained. Wet peat after it is taken from the bog is formed into about 5-in. squares and placed on trolleys fitted with shelves, which are pushed into the drying channel. After this has been hermetically closed, a vacuum is produced and the water brought to boiling point. As soon as this has been effected, hot air is chased through the drying channel, which absorbs all the moisture and which afterwards, in the shape of steam, is condensed and used over and over again. The time required by the process is dependent on the quantity of water contained in the material to be dried. In the case of peat, trials have proved that about 20 cu. yds. of peat containing 85 per cent water have been dried to contain only 20 per cent water in a little more than two hours. It may here be mentioned that to produce one ton of peat coal containing 20 per cent of water, 6 1-2 cu. yds. of peat containing about 85 per cent of water are required. Peat coal produces according to the quality of the raw peat from 3,800 to 5,000 calories. The cost of production of peat coal amounts to about $1.50 per ton (in Germany); this includes cost of raw material, cutting and manipulating, all expenses connected with the drying process, as well as amortisation of plant, factory and management expenses.

For the manufacture of peat coke out of peat coal Mr. Stauber has constructed a special coking oven, which shows great advantages over the older models. Under the coking chamber a cooling chamber is located, into which the red hot coke is poured, thus allowing the coking chamber to be immediately used again. The coke produced is compact and particularly suited to the use of foundries, as it is hard enough to carry the weight of the heavy layers of ore placed on the top. Besides for smelting purposes, peat coke may be used for the manufacture of electric carbon and, in the same way as charcoal, for disinfecting purposes. The process of converting peat coal into peat coke is a cheap one, and the cost of production comes to about $3 a ton. Good coke has a ready market at prices ranging from $10 to $15 a ton.

But there are other industries which will considerably benefit by this invention. Among these, brickworks may specially be mentioned The procedure also in this case is extremely simple. The bricks after being formed are ranged on trolleys, which are pushed into the drying channel. After the required percentage of water has been extracted the trolleys are wheeled to the kiln, where the bricks are baked. Considering that a lot of manual labor consisting of loading and unloading is thus done away with, which in round figures means a saving of 50 cents for a thousand bricks, that a lot of ground hitherto necessary for drying can be dispensed with, and that in using one drying apparatus of ordinary size 15,000 bricks can be dried ready for burning in 24 hours, it will be understood that brickmakers, by the adoption of the Stauber process, are perfectly independent of the state of the weather and may

go on working all the year round—great advantages accruing from the application of the Stauber drying process. To sum up the Stauber drying process may be used with great advantage to evaporate liquids of all sorts, to dry produces of the chemical industry, to dry clay, chinaware, cement, bricks; to dry hemp and all kinds of spun goods, to dry wood, lignite peat and other combustibles; to dry glue and cellulose, to dry beet root chips (manufacture of sugar), and barley hops (brewery).

The progress of this new industry will be watched with interest by all interested in fuel consumption.

Dalny, El Dorado in Russian Siberia.

Advance sheets of Consular Reports issued on March 17, 1902, by the Bureau of Foreign Commerce, Department of State, contain a lengthy description of Dalny, the Russian commercial seaport in north China. Dalny, in Russian, means "far away" and to the Russians this is indeed a distant seat of commerce. It is the Pacific coast terminus of the Chinese Eastern railway and its connections, the Central Manchurian and the great Siberian Railway and is a commercial seaport of growing importance. It was established, created and constructed in accordance with an edict of the Emperor of Russia dated July 30, 1899, and Henry B. Miller, the American consul from Niuchwang calls special attention to the commercial advantages open to the enterprising American citizen. He states that there are 23,000 men daily at work in the construction of the port, much of which has already been erected. The city will be free to the people of all nations. Good firms marketing good products suitable to that country should send a permanent agent there to represent them and he considers that Dalny offers a special opportunity to the establishment of new business enterprises. The most serious drawback to American trade in China and throughout the Orient is the limited number of citizens of the United States to be found there. Great Britain has about 10 representatives to America's one, and nearly all tradespeople, while Germany is pushing her commerce with equal aggressiveness and success. It is interesting to note in conclusion that in the regulations for building it has been decided that in the European settlement, buildings are not allowed to be constructed with mud or inflammable roof material, while in the Chinese town all buildings must have stone foundations with burned brick columns and lime mortar for plastering. The official language in Dalny is Russian and persons not acquainted with the Russian language must send communications and complaints in either Chinese or English accompanied by $2.00 (94 cents gold) for translation. All sums are to be paid in Mexican dollars.

The American Exhibit at Cleveland.

The American Clayworking Machinery Co., Bucyrus, O., had an extensive line of exhibits, foremost among which may be recorded the new side cutting table which is selling like the much vaunted hot cakes, the popular Eagle repress, and there was also shown in section the new ball-bearing dry pan step. The famous war-cry of the Bucyrus people, "Built Right—Run Right," was to be heard on many lips and there was an incessant clamor for the horseshoe badges decorated with the clover leaf and good luck penny, the emblem of the prosperity which attends the users of the Bucyrus machinery. Handsome literature, neat little booklets, were distributed by hundreds and there was no cry about "nothing doing" in that section of the exhibit room, for the various representatives of the company were kept busy the whole time.

The Meadows Drier.

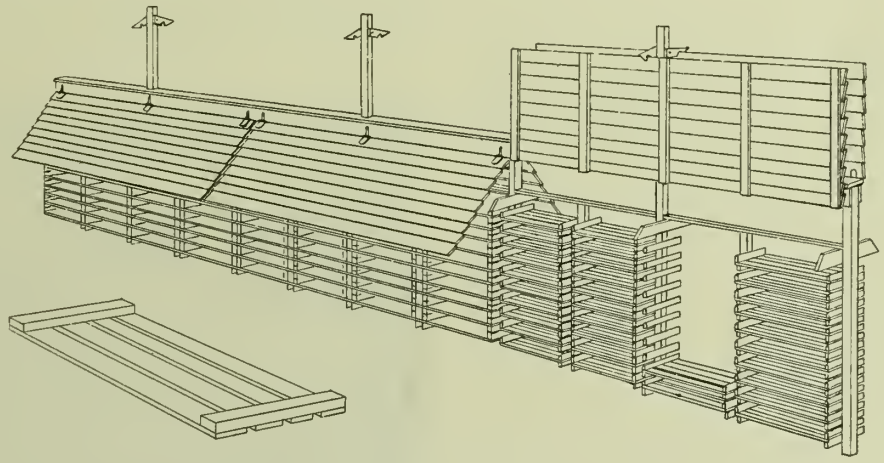
In answer to inquiries for further information concerning the drier built by William Meadows, Burlington, Wis., and illustrated in "Brick" for March, page 149, we reprint the illustration and give the following details:

All the posts are 4x4 in. The long posts near the tops of which are the catches for holding the roof doors when up are 14 ft. long set 3 ft. in the ground; posts at the ends and half way between the long ones are 10 ft. long set 3 ft. in the ground; the other posts are 8 ft. long, set 3 ft. in the ground.

Cleats to support the pallet are strips 2x2x22 in. nailed to the posts. At the long posts are cross pieces 1x6x36 in. to support the movable roof when lowered.

The pallets consist of four strips of 1x8 in. 2 ft. 10 in. long, fastened to end pieces.

"Brick" Illustrates Here



A Valuable Contrivance.

DRIER DESIGNED AND BUILT BY WM. MEADOWS, BURLINGTON, WIS.

The Menke Pottery Co. of Trenton, N. J., has purchased a site at Millville on which to erect an additional plant.

The W. S. Dickey Clay Manufacturing Co. of Kansas City, Kan., will build an additional plant in southeastern Kansas this year, at a cost of $200,000.

Progress of Brick Manufacture in the South.*

By Clarence M. Steele, Statesville, N. C.

Probably in no other business is there a more sure future than the brick business. Brick making in the south is making great strides; there is more and more new machinery bought every year. There are yet comparatively few large plants and these are near the larger cities. The smaller cities and the towns are supplied by

VIEW OF COL. J. C. STRIBLING'S PLANT, PENDLETON, S. C.

a considerable number of small plants, not a few of which have been run with insufficient capital and too often without experience in the business. It is generally supposed that anybody can make brick, when as a matter of fact it requires a more thorough knowledge and more experience than the average business. There is the selection and preparation of the clay, making, drying, kilning and burning of the brick, failure in any of which means complete failure. There has been a very noticeable improvement in the last year or two; the importance of selecting suitable clay is better realized. Plants are now rarely put up without some previous tests of the clay. Great improvements have been made in the last year in grinding and mixing the clay before it goes to the machine. Many disintegrators and pug mills have been put in and many more would have been put in but for the wet season, as they are not needed so much when the clay is wet.

Brickmakers often find that while they are able to make a good brick in the spring, as the season advances the brick turned out are more inferior and they are overrun with bats. The cause is in the clay drying out as the dry weather comes on, and when it is fed direct to the machine it is not ground and mixed sufficiently to take the water. Dry clods will go through the machine; they then absorb the dampness from the clay around them, which causes them to expand and crack the brick. Stones will do the same in burning. The use of grinding and mixing machinery will remedy this. A thorough soaking in the clay pit will be of great advantage, especially when the clay goes direct to the machine.

In all except a very few large plants, the bricks are air and sun dried. This necessitates closing down through the winter months, except in the far south. The demand for brick, however, is or has been comparatively small in the winter. A few extra kilns were made for winter trade. In the last year or two the demand has been so great that no stock could be accumulated. This is especially true of last season. The wet spring and early summer together with a number of freshets so interfered with making brick that contracts were hard to fill. A great many yards are located on streams and were greatly damaged, some of them being entirely submerged. Brick on the yard would not dry, and brick makers were afraid to take large contracts for prompt delivery unless they had artificial drying apparatus and a clay bank that was not submerged. Undoubtedly a good many building projects were abandoned for a time on account of the uncertainty of getting brick. This state of affairs led a great many brick makers to a resolve to put in some sort of a dry house by another season, and here is where many may make a mistake. Many have made the mistake of putting good money into the building of a dry house which was purely an experiment, with the result that if the brick could be dried at all it would cost more than enough to knock the profit out of the brick. I have seen numbers of brick makers who have lost hundreds of dollars in experiments of this kind. I mention this with the hope of saving some their time and money. Driers are a necessity in the north and are of great advantage to large works in the south, especially where the capacity is large; it would be almost impossible to get yard room enough without them. They also reduce the cost of handling large capacities. It is necessary that driers be designed and erected by experienced men. They must be fitted in the best possible manner, especially if a steam drier, which is the most common. They use the exhaust steam, which greatly reduces the cost of operation. The waste heat from the kilns is beginning to be utilized for drying, the heat is drawn off by fans and distributed in the drier. These driers are expensive, generally costing more than any other part of the plant. The large majority of yards in the south will use open air for drying for a long time to come. If proper care and attention is given the brick on the drying yard, very few will be lost.

When the demand is good through the winter at good prices and

A GLIMPSE OF THE CLAY PIT.

capital is too limited to put in one of the best driers, a dry floor can be constructed with less expense. They are not economical in the use of fuel.

Another great improvement noticed in nearly every yard in the last year or two, is the use of winding drum and dump cars for

*Photographs and data obtained through the courtesy of the "Tradesman," Chattanooga, Tenn.

getting up the clay. This is a great saving in cost as well as more satisfactory than any other way of getting up material. In most of our yards no permanent kilns have been used. This will not be true much longer, as a good many are putting them in now and all progressive brickmakers will soon see their advantage. The time will soon arrive when few soft or salmon brick will be sold. Too many of our yards now average very little over two-thirds hard brick. With good kilns the average is higher, sometimes 90 and 95 per cent hard brick. Possibly eight out of every ten machines in operation in the south are auger (or wire cut) machines. The best brick machine is none too good. The brick maker realizes that he is not making brick to perfection, therefore he is always looking for something better; he has about realized, however, that no perfect brick machine has ever been made, or is likely to be, for making stiff mud brick, one trouble being varieties of clays, hardly any two beds requiring exactly the same treatment. The auger machine has been found to make the best brick from a considerable range of clays for the least cost for operating and handling. They have less wearing parts and will stand the handling of the brick yard negro better. There are comparatively few dry press machines in use in the south as yet, and they are specially adapted to the manufacture of front brick, which are fast coming into general use. There is a demand now for more press brick factories, along with the many new and up-to-date brick plants which will be built in the next year or two there will certainly be some press brick plants.

A large number of the new plants are being built on the railroads, and this gives them many advantages. In the larger cities wood is so scarce and expensive that coal must be used for fuel, and it is a very unhandy and expensive business to haul coal in large quantities. Brick can be shipped cheaper than hauling, especially when the works are a good distance out, as is usually the case in city works. If far enough out, land can be bought cheaper, also wood. A location should never be selected because it is cheap, however. Good clay is the first and most important

BURNING A 350,000 KILN.

thing in locating a brick plant and success depends to a large extent on the clay.

Another great advantage to works located on the railroad is being able to furnish brick to other towns and cities around. Often the first thing we see in approaching a city is busy brick works with the smoke of their kilns and stacks floating skyward.

We are making some progress in paving brick manufacturing, but are not keeping up with the west; possibly the principal reason is that southern cities do not yet fully realize their advantage for street paving. The cost of getting paving brick from a long distance for test pavements is no doubt the principal reason. A good many inferior brick have been used for sidewalk paving which did

DRYING ACRES OF BRICK.

not give satisfaction. This would leave the impression in the minds of many that brick are not good for the purpose. Brick-makers should not furnish brick for this purpose unless they are vitrified; they will certainly do injury to the product they manufacture. Another reason paving brick are not more extensively made, is the lack of information as to whether we have clay and shale suitable for the manufacture of paving brick. I am satisfied we have plenty of suitable material, as good pavers are already being manufactured in some parts of nearly every southern state. In the next few years we will see good paving brick manufactured all over the south. We must have good streets, and what is there so good as brick for the purpose?

Possibly the most important improvement we have to note in brickmaking is the men of capacity and means who are going into the business. They can figure a good profit, and by careful management, with a good plant, the business is very profitable.

Continual vigilance is the price of success in making brick as well as in most other things. You can tell at first glance when you have found a well managed yard. In the first place you do not have to climb in over brick bats, everything looks prosperous. No leaky steam connections, machinery well-oiled and running smoothly and every man in his place.

It should be plain to all that there is a great and growing future for brick makers. Brick will be used more and more and wood less and less. Material for making brick is almost as cheap as common dirt, while timber is fast disappearing.

The thing most needed in brick making is to get some of our young men to prepare themselves for managers of brick works. There is already a considerable demand for superintendents and there is no supply. The young man who learns the business thoroughly and can prove his ability to manage a large yard well, is sure of a good salary. Industrial education is what we need in every branch of industry. We must get our young men to realize that they must know some one thing well to make a success.

Power and Its Economical Transmission.

BY HENRY SOUTHER, MECHANICAL ENGINEER, OF HARTFORD, CONN.

The following lecture, delivered by Mr. Henry Souther, of Hartford, Conn., on "Power and Its Economical Transmission," will be full of interest to our readers. Economy of power is a potent factor of success in any branch of the clayworking industry and every contribution to our better comprehension of the subject should be carefully digested.

Mr. Souther lectured in the rotunda of the Board of Trade, Toronto, before the Canadian Manufacturers' Association. We reprint the address from Industrial Canada, which is published by the Association. Mr. Southern said:

The subject on which I am to talk is hackneyed. It has been discussed continually before our many engineering societies. To-night I do not mean to handle the subject in a strictly technical manner, but rather to give a resume of my findings from experiment and experience, and in such shape as may be useful to managers and superintendents.

POWER.

Naturally the first thing to consider in connection with the subject before us is the source of power in an industrial establishment, and to determine the best source of power the only basis of comparison in these commercial days is that of cost.

The only power we can obtain for practically nothing is that from falling water. The cost of harnessing is considerable, but after that there is nothing to compare with water power for small cost. I expect to see the time—or at least I believe there will be a time, if I do not see it—when every waterfall will be utilized. This is becoming more and more possible with every addition to our knowledge of electricity. It is now not necessary as of old for a factory actually to overhang the stream from which the power is obtained; on the contrary it is often better for it to be at a reasonable distance with only the generating machines at the canal or flume. Other things being equal, therefore, water power is best, for it is cheapest.

THE STEAM ENGINE.

The only other commercial source of power is heat from coal or oil. The common form of reciprocating steam engine in its many forms of single and multiple expansion is at present almost universal; but it seems to me that a change from the reciprocating to the rotary is coming, our now popular type will become obselete and the rotary type universally used.

This movement has made considerable headway in Europe and is beginning on this continent. The electric light company of my own city has put in the largest Parsons Turbine (3,000 H. P.) which is running well and very economically as compared with the best reciprocating engines. Turbines of the De Laval type are creeping in very fast for small units of power being better adapted to many small uses than any other machine. They are economical at all powers within their own maximum. The coming power, however, in my opinion, is that obtained from liquid fuel (oils) direct, perhaps from solid powdered fuel as well, or from either one gasified. We obtain power now in this way by so-called gas engines, more properly speaking combustion or explosive engines. As yet they are not always successful, but tremendous strides are being made in perfecting these engines and the number in actual use is now very large. All things considered, however, the best engine or other source of power for any given place or installation is not determined by its economy, its cost or the type; but rather by the combination of points that will contribute most to lessening the cost of production of a given article.

OTHER SOURCES OF POWER.

In the future we may look forward to the storing of power from the heat of the sun. This is now experimentally possible and is being accomplished in the sunny climate of California; but I do not think that any of you gentlemen would undertake to equip a new plant just at present and in this climate with its only source of power the sun. Many things more wonderful have been accomplished lately, but this scheme will wait until the commercial necessity for it arsises, although it looks to me as if the present rise in the price of coal would hasten its coming.

Then again the man who professes to multiply power indefinitely by intricate systems of gearing or some other equally impossible scheme is not yet dead; I fear we must jolly him along, however, and let him down easy without counting him as a serious proposition. He is ingenious and interesting but not profitable.

DISTRIBUTION.

Having the power, how shall it be most economically distributed to the producing point. Means for doing this are multiplying fast through the development of electricity, gas engines and the use of compressed air. The various possible systems are in part as follows:

Steam engine driving shafting by gearings, spur or bevel.

Steam engine driving shafting by belts or ropes.

Steam engines driving electric generator transmitting power over a plant with but few if any belts or gear drives.

Steam engine driving compressor of air and transmitting power in pipes over a plant to many forms of tools and lifts.

Gas engine transmitting power by belt or otherwise.

Central gas generating plant distributing gas over a plant in pipes to many engines of small units.

Every engineer or factory manager has his own ideas about these methods, and I dare say every one is much in the right as to his own peculiar case, in regard to which he is necessarily well informed. No one of the methods is best for all cases. Each particular one must be studied carefully. Conditions are also changing rapidly, what may be best one decade may not be best the next. How rapid this change is is well illustrated by the following quotation from a most eminent engineer made as recently as 1867, William Fairbairn. In discussing transmission he said in part, referring to belt drive, at that time new and mostly used in America, while the gear drive was almost universal in Europe, "the advantage of straps (belts) are the smoothness and noiselessness of the motion: their disadvantages are cumbrousness, the expense of their renewal and the necessity for frequent repairs. They are inapplicable where the motion must be in a constant ratio, because as the straps wear slack, they tend to slip over the pulleys and thus lose time."

How little these things seem to bother us now, and how few gears there are as compared with belts, notwithstanding the faults of the belts, as expressed by Mr. Fairbairn. It is almost useless, it seems to me, to talk on such subjects as these, inasmuch as what one says become obsolete so soon. All one can do is to act quickly in establishing a plant; take that which is most applicable at the time, and charge off each year enough from the machine account to buy all new in ten years at the longest. Above all things, in laying out a plant, no matter how small, do not proceed by rule of thumb, but think the entire arrangement out and plan it to scale on paper, determining the speed and position of every shaft and pulley; providing for everything beforehand. By other methods much work is repeated, and never as well done as it might be

ELECTRIC TRANSMISSION.

The most lively discussion has always followed when the question of electric transmission has come up for consideration in all our engineering societies. Its exclusive use is advocated by some. By others, it is absolutely condemned. The intermediate course will undoubtedly be the final one adopted. For certain work it is incomparable. For example, the large printing presses of today may be better manipulated by separate motor than by belt drive from a main shaft. Entire independence of speed, reverse, repeated trials of the print, stopping and starting, and finally, the cleanliness, make the motor drive directly connected, almost essential. The government printing office at Washington has materially reduced the expense and increased the product by the adoption of the motor drive throughout the place.

All machines served by overhead cranes should be motor driven so that the crane shall not meet the interference of belts. The printing press is one of these. All shops where groups of machines are run independently of other groups should be equipped with motors of each group. As a rule it is well to equip all heavy machine tools with independent motors, inasmuch as such tools stand idle much of the time. The plants in cotton and woolen mills need not be equipped with motors, unless, perhaps, certain floors or departments are often run alone or are frequently shut down when the remainder of the mill is in operation. Anything that will do away with heavy and long belts will prove a commercial advantage. One case that came to my knowledge was a long belt that drove machinery in another building and around a corner. Some thirty horse power was consumed in driving the other department. A separate motor was installed for trial. A ten-horse power motor did the work and consumed only about six horsepower doing it. The trial became a permanent fixture.

How far to carry the idea is hard to determine. The first cost may be heavy, and yet so much savings result that this cost is wiped out in a year. Convenience in a shop rather than the cost of the motor or the power to run it is most often the determining factor. Assuming that by introducing electric motors generally throughout a shop, the cost of all things considered were the same, it is quite possible to imagine such conditions that increased convenience would save 50 per cent of the cost of the product. First cost and power might be disregarded under these conditions. Every case should be carefully considered by one familiar with all the conditions. If in doubt, a few motors should be tried, but nothing under five horse-power units should be used except in rare cases. The smaller units are expensive and not efficient, and machines should be grouped to get the five-horse power.

TRANSMISSION LOSSES IN GENERAL.

Competent and careful investigators have repeatedly found the losses of transmission due to driving or transmission devices to vary from 5 per cent to 90 per cent of the total power consumed. Here, then, in these days of small margins and close competition, is the chance to save an annuity that will amount to a fair profit in most cases. The average loss of transmission for the cotton mill and flax mill is 60 per cent, and for the woollen mill 40 per cent. In heavy iron working plants the loss is about 15 per cent. In any small mill or workshop the matter of friction is of the greatest importance, and, if I am not mistaken, it is in the small mill that one generally finds the greatest neglect of such matters. In the large organizations such things are in the hands of some particular persons, whereas, in the small mill it is no one's business, and is neglected. Friction in mills is subject to great variations. Probably half the friction in the small mill is caused by lubricated surfaces. A change in temperature with improper lubricants, such as heavy animal oils, may increase or diminish friction to a considerable extent. Prof. Thurston estimates the friction of shafting in general, including the total belts and bearings, and varying with the size and load, at from 33 horse power to 1.5 horse power per 100 feet. Prof. Benjamin, by careful investigation in many shops and with every precaution for practical and at the same time accurate results, found that in six machine shops, where heavy machine work was done, an average of 62.3 per cent of the power produced was used in driving the shafting alone. In one case it was 80 per cent. This is explained by the fact that the shafting had to be built large enough for tools that are often idle, and necessarily the shafting must be kept running. In this item the tension of belts is a serious matter. A belt should be just tight enough to do its maximum work. Many belts, if not most of them, are much tighter than is necessary. No easy means is at hand to ascertain how tight a belt may be, and the belt mechanic sets it firm and tight to make sure that it shall not slip. Then when a wet day comes, a shop full of moderately tight belts makes a heavy drain on the coal pile. In this same investigation it was determined that the busiest of tools was only in operation 80 per cent of the time and the average tool about 33 per cent of the time.

The argument has been made by those opposed constitutionally to nice work toward economy of any kind that the power amounts to little or nothing in the cost of a product. As a matter of fact the cost in percentage is small in machine shops, being from 1½ per cent to 2 per cent. This seems small indeed when stated this way; but looked at as an annuity, it takes on another aspect. Supposing for example the product costs a million per year, 1 per cent means ten thousand dollars.

Another class of losses occurs in the bearings of the machines themselves. This is an important point, and one on which I wish to bear strongly at another time. It has been found by test with motors, for the driving power, that printing presses, and other heavy machine tools, consume twice the power running idle that they should. Investigation disclosed the fact that the loss was in the bearings, and that they were very tightly adjusted. There is no means of telling how tight a bearing is when it is one of many in a train; and had the machines in the cases mentioned been belt driven from a shaft, the friction would have continued until heating occurred or until the bearings wore loose. Again, to offset the argument that power saving is in any case only a small factor, we must consider that where there is friction there is wear, and that cost of repairs is increased by friction. This is a serious matter in the case of line shafting and counters. It means a mechanic at the works many Sundays in the year, to overhaul bearings and loose pulleys. The following general principles have been laid down by Prof. Benjamin to save friction losses in manufacturing establishments. There are none better, and I quote:

1. Use pulleys of large diameter on counter shafts and narrow fast running belts.

2. Use the best oil for the purpose and enough of it, catching the drip and purifying it for repeated use.

3. Have everything oiled regularly, and do not depend too much on even the best of oiling devices.

4. Inspect line shafts to see if in line and will turn easily.

Neglected shafting both in respect to alignment and lubrication is the cause of tremendous friction. Anything that will do away with both of these evils at once deserves earnest consideration. A good so-called "frictionless" bearing will do this, as lubrication is practically unnecessary, and heavy pressures produced by lack of alignment count but little. More of this later. Samuel Webber subdivides the friction in a mill as follows: To run loose pulleys and their belts, 10 per cent; to run main shafting, 20 per cent—the engine itself takes but 6 per cent. He puts overtight belting, and consequent bending of shafting with resulting heavy journal friction, as the chief cause of transmission losses. I think the average manager does not look at it in this light. Even this source of fric-

tion may be avoided. If managers of factories would only take the pains to measure their idle load once in a while, they would find the information gained both instructive and surprising. Comparatively few do it.

Some noon hour or some evening at six o'clock turn off all work on all machines and see what your engine indicates; it is something any of your engineers can do if furnished with an indicator, and I am sure you would feel repaid. Nine times out of ten, you will overhaul a considerable number of things.

Is it not true that in almost any shop, if the bearing does not get heated, if it does not make a noise, if it does not stop the mill and nobody kicks, there is not much thought about it?

My experience in such matters has been that some shafts may be turned by hand, and in other cases of similar dimensions a bar stuck through a pulley may be used for a lever in order to move at all. Subsequent test in these cases showed corresponding losses. In one or two instances I have seen loose pulleys driving shafting and waiting for Sunday repairs.

BELTS AND ROPES.

As a matter of general interest I thought I would look up the origin of belts. After doing so I made up my mind that it was prehistoric. The first belt on record seems to be in connection with the fire machine, the original method for starting a fire by friction. A ligament or other string was wound about a pointed stick and pulled as in spinning a top. Then followed the use of the belt in all the various ways known to us. It is old, but it is good, and I doubt very much if we shall ever drop it entirely notwithstanding electrical motors. The rope is newer as a commercial feature. It serves its purpose admirably and is an efficient driver. Careful experiment has shown that when well arranged in each case, the efficiency of belt and rope is practically the same. The rope has one practical advantage, and that is that the tension may be exactly controlled by tension pulley and weight. On the other hand, the rope is not good for small powers. The necessary splicing and complication of manipulation count against it and practically bar the use of any size smaller than ¾ of an inch. A rope running over too small a pulley goes to pieces very fast and the rope drive has suffered on account of this mistake in installing.

The following figures give an idea of the proper relative size of rope and pulley:

For a 1¼ in. rope diameter of pulley must be at least 3 ft.
For a 1½ in. rope diameter of pulley must be at least 4 ft.
For a 1¾ in. rope diameter of pulley must be at least 5 ft.
For a 2 in. rope diameter of pulley must be at least 6 ft.

These pulleys and ropes will transmit respectively per 100 revolutions per minute, 5, 8, 11, 15 h. p.

An increase of 25 per cent over these figures is possible when the bottom rope is the driver and under proper conditions. The best speed is about 3,300 ft. per minute. Cotton and manila are equally good providing long fiber cotton is obtained, and, in any case, the character of the splice is all important.

The comparative efficiency of belt and rope, as determined at Lisle, France, by official investigations, is as follows: Power transmitted, 162 h. p.; taking efficiency of rope at 100 (manila) cotton is 100.87, and leather belt 100.37. To all practical purposes this difference is nothing.

As I have already emphasized, belt tension is most important. It is estimated that the pull of a belt is, as a rule, at least three times that necessary to transmit the power required. The velocity of belts should be kept at the maximum possible point, and the most efficient velocity is given at 4,000 to 5,000 ft. per minute. Data on belts is to be found anywhere, and I will say but little, as there are branches of my subject on which there has been absolutely nothing written or published.

SHAFTING AND HANGERS.

There is little to be said on this topic with regard to the possibility of saving power. Keep everything in line, look at it frequently and see if it is in line; do not assume that once put in line it will always remain so, for it will not. Use a hanger that will adjust itself as far as possible to the necessary irregularities of alignment. If you use a hanger that is so-called self-oiling be careful to see that it is oiled. Make it somebody's business to see that the shafting is kept in an efficient condition. When a bearing becomes hot do not at once pitch into the oiler; take a look at the alignment.

If your pulleys are small your tension will be high. If your pulleys are large enough, as already mentioned, then the shaft speed will be right and the shafting correspondingly light. Shafting should be figured for bending strains rather than for torsion or driving strains. All the above is common knowledge, but is sometimes overlooked because it is so common, and for that reason I have taken the liberty of repeating it to you.

(To be continued.)

Improvements at Macomb Ill.

The Macomb Sewer Pipe Co., of Macomb, Ill., which was organized in 1883 and manufactures vitrified salt-glazed sewer pipe, glazed farm tile, glazed wall coping and well tubing, and fire clay flue linings, has decided to spend about $30,000 in the immediate overhauling of its plant, doubling the size of the main building, and increasing in like manner the kiln capacity. A car line will be built about two miles to the company's clay mines. The concern is now in the market for the purpose of the necessary lumber, roofing material, machinery, brick, light T-rails, pit and dump cars, kilns and kiln irons, trucks, dies, barrows, fans and drying apparatuses, clay screens, steam pipe, watchman clocks, time clocks and tools and appliances of all kinds used in the business.

Broke the Record.

The Geo. H. Clippert & Bros. Brick Co., of Detroit, are proud of having broken the record for hundreds of miles around in the number of brick produced in a year on a single soft-mud machine. When equipping its yard it looked for the things that would give the best results without delays or shut-downs, and has recently made the following statement in a letter to the Wellington Machine Co., of Wellington, O.: "From March 12, 1901, to Feb. 20, 1902, we have made 9,001,850 brick on one of your "Monarch" machines, running 32,000 brick per day as a day's work of about nine hours."

Chestnut Ridge White Brick Co.

An error caused us to print the name of the purchaser of the Chestnut Ridge Railroad Co. and the New York & Pennsylvania Brick, Tile & Terra Cotta Co. as "James Deemer," of Yonkers. The gentleman who purchased the property on behalf of himself and a number of other prominent New York people was James G. Beemer, who resides in Yonkers. The two companies have been reorganized with ample capital under the names of the Chestnut Ridge Railway Co. and the Chestnut Ridge White Brick Co. The railroad is now being improved and equipped with new rolling stock, and the brick plant will be put in operation immediately. It is proposed to make only high grade white bricks. The brick in the new Ansonia apartment building, located at 73d and 74th Sts. and Broadway, New York, which is probably the finest private building in America, were made at the plant of the Chestnut Ridge White Brick Co. The New York office is No. 121 West 42d St.

Wisconsin Clayworkers' Association.

Proceedings of the Second Annual Convention, Held at the St. Charles Hotel, Milwaukee, Jan. 28-30, 1902.

(Continued from page 151.)

Third Session, Wednesday Afternoon at 2 P. M.

The committee appointed on the amendment to the by-laws then reported through the chairman, Mr. Hinkley, as follows:

Your committee have had this subject of the amendment to the by-laws under consideration, and we offer the following as our recommendation:

That Article V, Section 4, of the constitution and by-laws be amended by striking out the words "And he shall also receive moneys and pay them over to the treasurer and keep an account of the same," and inserting in lieu thereof, "Compile and keep a correct list of all clayworking factories in Wisconsin, with the names of their owners or operators and superintendents," so that when amended the section shall read: "It shall be the duty of the secretary to keep a record of each meeting and compile and keep a correct list of all clay working factories in Wisconsin with the names of their owners and operators or superintendents, conduct all correspondence and other business as the Association may direct, and make a full report at each annual meeting."

Also amend Article V, Section 5, by striking out the words "From the secretary all moneys belonging to the association," and insert in lieu thereof, "All dues and other moneys belonging to the association," so that when so amended the section will read: "It shall be the duty of the treasurer to receive all dues and other moneys belonging to the association and receipt for them, to keep an account and pay out the same on the order of the secretary when countersigned by the president, and make a full detailed report at each annual meeting of all receipts and disbursements."

And as amended your committee would recommend the adoption of the same.

The motion carried.

Appointment of committees and miscellaneous business.

The President appointed the following committees:

Committee on Nominations: William Finnegan, of Green Bay, Chairman, J. S. Fifield, of Janesville; E. R. Buckley, of Rolla, Mo.

Committee on Resolutions: J. B. Theriault, of Chippewa Falls, Chairman; A. W. Hilker, Racine; J. W. Brownrigg, of Merrimac.

Committee on Time and Place of Next Convention: J. H. Hinkley, of Green Bay, Chairman; F. L. Sanborn, of Portage; H. Klemme, of Sheboygan.

Then followed the president's address which was published in "Brick" for February, page 109.

The next paper on the program was read by Mr. Randall as follows:

PAVING BRICK, SEWER PIPE AND OTHER CLAY PRODUCTS USED IN CITY IMPROVEMENTS.

By C. H. Stanchfield, City Engineer, Watertown, Wis.

In taking up this subject I cannot expect to describe to you the process of manufacture of these different materials for this is a matter which is a part of your business and not a part of mine. All that I can do or expect to do is to outline the properties which are desirable or essential in these materials, relying upon you to produce, in practice, the results desired. In the discussion of the clay products with which we have to deal in city work, one's mind naturally turns first to the consideration of paving brick, as this material forms the largest and most important part of such products at the present time and I am bound to say that of all the paving materials which have come under my observation good brick, all things considered, approaches nearest to the ideal street surfacing material when used in a climate as severe as that of Wisconsin; and unless some more desirable material is brought into the field, we must look to this for so-called permanent street improvements. In the production of paving brick, the first object to be accomplished is the rendering of the brick impervious to water and thus to frost, as the latter only invades material to its detriment, when the former is present. This property of imperviousness is also of greatest importance from a sanitary standpoint which is one of the strongest arguments in favor of brick for paving purposes as against wood or other porous material. To attain this end the clay must be capable of being vitrified to a degree approaching perfection without losing its form and be capable of being annealed to such a degree as to prevent chipping or breaking under the heavy traffic which it is the lot of most brick pavements to carry. But above all things the brick must be uniform in texture and hardness to insure equal and even wear. It is a deplorable fact that paving brick cannot be, or at least thus far have not been, produced in this state. The market is extensive and the financial returns of a plant able to produce the proper material would be far in excess of those from a building brick plant, and would at the same time be of great benefit to the citizens by rendering good street surfaces possible, without the great outlay which is now necessary on account of the distance which our brick must be transported.

About the same remarks as have been made in regard to the physical properties of paving brick will apply with equal fitness to sidewalk brick and tile except that the process of vitrifying need not be carried so far, since the wear is less severe. About the greatest enemy to be encountered is frost; so that a brick which can be made impervious to water within reasonable limits, say not to absorb more than 6 per cent to 10 per cent of its own weight of water, when thoroughly dried and immersed for 48 hours is most desirable for sidewalk purposes. A brick which complies with this requirement will naturally withstand all the wear which it will be called upon to endure and will therefore be entirely satisfactory for sidewalk purposes. I am sure that such a brick can be produced from many of our clays with proper manipulation. Brick will necessarily have to compete with cement as a sidewalk material and will have to be produced at a less cost than cement walk when laid, as it is the opinion of most property owners that the latter is more desirable as far as appearance goes, although when the safety of pedestrians is concerned brick meet with greater favor.

With reasonable care in the removal of snow from brick walks, the well known slippery condition, which is so common to the surface of cement walks, will be avoided. When we take into account the progress which has been made in the manufacture of portland cement within the past five years and the corresponding reduction in the selling price, it is evident that brick for sidewalk purposes must be sold at a price much below the present cost of cement, in order to compete with that material at its lowest figure.

Sewer pipe, being called upon, as it is, to resist the invasion of both moisture and gases, must even more than the previously mentioned clay products, be impervious. In the case of sewer pipe, however, this condition is reached in part by the process of salt glazing. This method of making the ware impervious is entirely satisfactory, as the interior of the pipe need not be vitrified further than to give it the strength necessary to resist the pressure which it is subjected to from without.

In municipal work drain tile are used only in underdrains and as they are not called upon to carry much load it is only essential

that they be porous, true in form, and burned sufficiently to prevent crumbling. Drain tile may be made of almost any of our good brick clays.

Another use of burnt clay which so far has not come into very great prominence in this country is in the building of roadways. It has been used more or less extensively as a ballasting material by some railroad companies where gravel and crushed rock are not available, and has proved very satisfactory and very reasonable in cost. It would seem that much of the impure clay, which is most desirable for this purpose and which is now a menace to some of our yards, could be manufactured into this material. To this could be added the accumulation of broken bricks, having been previously crushed, and the whole turned into cash at a profit. At the same time the yards would be cleared of undesirable material and assistance given to the movement for good roads in which we are all interested. Inasmuch as no expensive machinery or skilled labor is required in the production of this material, I hope we may expect the members of this Association to give instructions in this work, to these having more direct supervision of our roads and streets, to the end that good roads may be built even though the materials which we have heretofore believed necessary, viz., gravel and crushed rock, are not available. The impure clay, which renders our highways impassable, may be utilized for their improvement. As stated by Mr. Chas. R. Keyes in a recent issue of the Review of Reviews, this may be accomplished with no more expenditure of money and effort than is now put on country roads. Ballasting with burnt clay will produce in a dozen years a system of highways equal to any of those for which France has so long been famous."

The next paper was "Technical and Trade Literature, and Its Value to the Clayworker," by J. W. Hinkley, Green Bay, Wis. (This was published in "Brick" for Feb., 1902, page 111.)

Mr. Randall: As a matter of fact and for truth and history, I will make one statement in regard to the book of Mr. Charles T. Davis which Mr. Hinkley mentioned. While that book was copyrighted in 1884 it was not issued until 1885, nearly two years after the Clayworker was first started; so the Clayworker in America is really the pioneer publication in the interest of the clay working art. Davis's book came out nearly two years after that—I mean after the publication of the Clayworker.

Mr. Joannis: The extreme modesty with which I was born prevented me from getting up until I was called. I think, however, that there are one or two things which Major Hinkley touched upon which he did not fully explain, and without any disrespect to his admirable paper, I wish to call attention to a class of literature too often not classed as such—namely the admirable catalogs produced by our machine men. I think these contributions to clayworking literature are extremely valuable. The catalog which you handle so carelessly when it is sent to you, will, if you will turn over its pages, reveal to you machines of every conceivable variety. Nevertheless, you will simply glance at it, and if you don't want to buy at that particular time, you will throw it into some old rack which is covered with dust where it will remain until the next one comes around. Then you will scrap the old one out to make room for the new. I assure you, however, that a great deal of profit may be gained by careful perusal of machine catalogs. The machines which these catalogs advertise represent years of labor, thousands of dollars worth of failure and experiment, and finally a triumphant success which enables you to prosecute your labors with pecuniary profit.

Other very valuable papers which we may consider for a moment are comprised in the literature issued by the Federal government, the geological reports of the various states, the sheets which we get from year to year showing the annual increase in the production of the various clay products, and the enormous increase in the value of these products. I don't think there is anything which is so helpful to the clayworker as to see that there is general and increased prosperity from year to year, showing that this literature has a reason for its being. It is a reflection or mirror of your efforts. That is another feature of clayworking literature.

About "Brick" itself I need have little to say. The paper here, and at Chicago, will speak for itself, but I thought that possibly a few words would be interesting to you in regard to the method of preparing a trade journal. You have heard all about how soft mud brick, stiff mud brick and dry pressed brick are produced. Possibly a few words on the work that is required to produce "Brick," the trade journal which you receive every month, would be of interest. The man who launches out to cater to the trade of brickmaking, must know something about that industry himself. He need not be a practical clayworker because he must have other interests. He must not only have a general knowledge of clayworking, but he must also have a general knowledge of the printing business. (Here follows an interesting account of the manufacture of "Brick.")

The President: The next subject on the program will be:

CLAY BUILDING MATERIALS FROM THE STANDPOINT OF THE ARCHITECT.

By A. C. Clas, Milwaukee.

The title of this paper implies that my remarks will be from a practical rather than scientific standpoint.

Brick architecture may be made to possess great beauty. Burned clay can be molded into shapes as elegant and as artistic as can be carved in stone, and the various colors which it is easy to impart to brick or terra cotta may be used to form mosaics of the most beautiful pattern.

Terra cotta or brick architecture has been traced as far back as 400 B. C., and fine examples of that time exist today in the Louvre, and the British and Berlin Museums; also many places in Italy possess fine collections. Some of these examples show beautiful reliefs, which appear to have been largely used for decorations of flat surfaces of walls, pilasters and friezes.

The Greeks adapted terra cotta on a large scale for architectural ornamentation. Many fine examples have been found at Olympia, and other places. It was generally used in the construction of the cornices, which were blocked in stone, and veneered with molded terra cotta plaques, which were tightly fitted around angles and corners.

In the first and second centuries A. D. the Romans copied the Greeks closely for their statues and architectural ornaments.

Terra cotta was used extensively in the 14th and 15th centuries throughout Europe for architectural purposes, in a most elaborate and magnificent manner. Of late years it is being used more or less all over the civilized world; and we are constantly taking more and more advantage of the opportunities it affords. Why employ stone when we can with greater economy make use of a material which offers so many advantages—facility in transportation and handling? Its durability, its dense texture, the opportunities for colors, and its smooth surface make it especially suitable to an atmosphere filled with acids and soot.

Why in our buildings should we forego the use of glazed terra cotta? The architects of the Ren aissance in Italy and France did not hesitate to employ such materials, which are economical as well as decorative.

Brick is one of the elementary materials which is used perhaps more than any other. The growing scarcity of wood will make a still greater demand for brick and terra cotta and the manufacturer will in consequence have to extend and simplify the manufacture in order to promptly meet the increasing demand, at prices which will allow of their being used more generally.

There is no question but that in many localities in our state clay occurs from which terra cotta may be made that possesses all the necessary qualities, although one of our largest firms of terra cotta manufacturers in the west says that it has received a great many samples of Wisconsin clays, none of which have proved satisfactory. The great difficulty to be overcome in the making of terra cotta is the uncertain shrinkage of the clay and warping which is so liable to take place when it is made in large pieces. To obviate this as much as possible, different clays are mixed together, then ground glass, pottery and ofttimes sand is added. Clay which is fit for terra cotta must be plastic and have sufficient tensile strength in its raw condition to avoid cracking during its drying process. Terra cotta must be comparatively pure and uniform, and have a capacity for resisting the heat.

There is no reason why tile cannot be manufactured in Wisconsin. It is made of somewhat the same material that ordinary bricks are made of, with the exception that the clay must be ground finer. Encaustic tiles are also made from ordinary clays and marls, carefully prepared—sometimes mixed with finer clays and different coloring substances.

The fact that numerous tests have been made, and the goods pronounced lacking in merit, does not necessarily mean that we do not have clays that are in every way suitable for the manufacture of tile, terra cotta, roofing tile, etc.

Perhaps one reason why we have no terra cotta or fire proofing plants in our state is because the use of brick has been so great in the past years that it has kept our manufacturers busy supplying the demand. Let us hope, however, that capital may be invested in the near future in the manufacture of other clay materials besides brick.

The value of terra cotta shipped into the state in 1901 will aggregate $195,000.

The amount of fire proofing shipped into Wisconsin will easily run to 12,000 tons. The face brick shipped in 1901 into Wisconsin will total 1,250,000, and the average cost of these brick is about $21.50 per M., f. o. b. destination.

The President: The program committee for the banquet has tried to give you something that will fill you to the extent of your mental capacity. The local committee will undertake to fill you, physically, tonight to your capacity.

We suppose, of course, you will all be at the banquet; we want to meet you, and around the board tonight we shall sing songs and tell stories and exchange the good feelings of the hour; and we are going to adjourn early so as to give you a good opportunity to get yourself in readiness for that occasion. We possibly shall have to call your attention to the hour of opening our session tomorrow, for you might forget it when the morning comes unless you all have a program so that you can keep it in mind.

The banquet on our program is for seven o'clock, but you won't get at the tables at that hour. It will be about 8:30. If you can tell stories and if you make it interesting for the machinery men and trade journal men and yourselves from now until that time we will guarantee that you will have enough to eat later. We believe that the period of suffering which must be endured from now until then will be fully repaid by the feast that is in store.

Adjourned till 9:30 a. m. Thursday.

Fourth Session.

Thursday, Jan. 29, 1902, 9:30 a. m.

The President: They say that after a battle it is the veterans that show up first, those that are used to the hard usages of warfare come in first; after that the raw recruits come in. You must all be veterans in entertainments such as last evening, and so you are on hand first. The first number on the program this morning is:

WISCONSIN CLAYS AND SOME OF THEIR CHARACTERISTICS.

By E. R. Buckley, Rolla, Mo.

I have prefaced my discussion of the clays of Wisconsin with a few remarks as to the classification and characteristics of clays, thinking that my discussion of Wisconsin clays might not be altogether intelligible unless I explained myself before beginning the discussion. So I have first to explain to you that the term clay, as we ordinarily use it, is applied to any earthy substance which contains a moderate quantity of kaolin, and which may be used in the manufacture of clay wares. In a general sense clay contains a great variety of minerals, and usually has a very complex composition. The composition of clay is even more complex in many cases than the composition of the rocks which compose the exterior portion of the earth's crust. Clay consists primarily of an aggregate of minerals, and if we analyze the composition of the clay still further we find that each individual mineral is composed of an aggregate of elements, of elementary substances. All of the material substance of the earth can be resolved into elements, and thus if we analyze clay we can resolve it first into the minerals of which it is composed, which minerals can be mechanically separated from one another. Then if we take the individual minerals we can by chemical means separate them into chemical constituents or elements. So we frequently have in any investigation of clays two kinds of analyses, one of which has for its object a determination of the minerals which together compose the clay substance; and another which shows the various elements of which the clay is composed. We speak very inaccurately of the content of aluminum, content of calcium, content of magnesium or content of potash, soda and iron. These various substances, these various elements, speaking more correctly, are combined one with the other to form minerals. Thus aluminum, oxygen and silica are combined chemically to form the mineral which we know as kaolinite, and kaolin is the mineral which in the strict application of the term is clay. When we speak of pure clay we mean clay which consists of one individual mineral, and that one individual mineral is kaolin, and kaolin is the white clay such as is used in the manufacture of the finest kind of porcelain.

The clays as they are found in Wisconsin do not consist of a single mineral, but of a great variety of minerals. And so if I wanted to burden you with a lot of difficult names to remember, which I am sure my friend Mr. Finnegan would object to, I would tell you that the clay which you are working in various parts of the state consists of various admixtures of kaolin, which is the essential constituent of clay, quartz (which you ordinarily know as sand), feldspar, calcite, dolomite, hematite, magnatite, and ilmanite, and many other varieties of minerals. If we desire to have a thorough understanding of a mass of clay, that is, if we care to go to the very bottom of the subject and investigate clays so that we may know and give a cause for every condition which presents itself in the manufactured product, we should know the percentage of each one of the minerals which constitutes a part of the clay; we should know the composition of those various minerals, and also know the associated minerals, or the group of minerals which are found in the individual clay. We should also know what becomes of the minerals when they are subjected under definite conditions to various degrees of temperature, both in drying and burning. These are the problems which confront the man who investigates the subject of clays. In order to understand the reasons for different percentages of shrinkage which brick manufacturing is only a small part, you will find that

in different brick, and in order to know the cause for the warping and frequent cracking of the brick on the yard, we must know and understand each of the individual minerals, and understand how they are affected when the water which you have added to the clay is driven off by heating. Now, it may not be expected, it is not expected, that the brickmaker or the manufacturer of clay wares will devote his time or can devote his time to a study of this part of the subject; and as I have said before the clay manufacturer can only take the results of some person who has devoted his life and his constant attention to this work and to the manufacture of his clay wares.

If you investigate more broadly the department of ceramics, of the manufacturer of the best wares, of the finest art works, of porcelain, and of all kinds of fancy pottery, must go back to the standpoint of the man who investigates clays from a scientific basis and understand the chemical and mineralogical composition of his clays as well as the way in which they behave under different conditions of drying and burning.

It may be interesting to you to have me tell you something in regard to the origin of clays. I am very certain that many of you are familiar with this subject, but it will do no harm for me to make an attempt to place before you in a somewhat systematic manner the origin of clays. In this connection I will say that all clays, whether they occur along the lake shore, along some stream channel, yonder in Central Wisconsin, in the vicinity of Eau Claire in the form of shales, or at Stockbridge and Oakfield in the form of shales, no matter where they occur, they are the result of the breaking down, the decomposition, of igneous rocks, rocks which have been formed from molten material, solidified within or at the surface of the earth. It is supposed that all the earliest rocks formed were of igneous origin. We have two classes of rocks, the igneous and the sedimentary rocks. The sedimentary rocks have been derived from the igneous rocks largely through the mechanical breaking down of the latter and thus the sedimentary rocks, sandstone, lime-stone and shale, which cover a large part of Wisconsin are often spoken of as secondary; simply meaning by the term secondary that they have been derived from some other rock. If this should be carried still farther it might be said that the clays are sometimes tertiary rocks. They may be either tertiary or secondary, depending upon whether or not they have been derived directly from the igneous rocks. If they have been derived directly from the igneous rocks they will be secondary, and if they have been derived by the breaking-down of the sedimentary rocks they may be known as tertiary.. In this connection I speak of the clays as rocks from the fact that scientifically any accumulation of mineral matter, whether solidified or not, comes in under the head of the term rock—that is the scientific application of the term rock.

Clays may be conveniently divided into two classes, known as Residual and Transported.

A residual clay is one that results from the decomposition of a rock in place. Take for example a thousand acres of land in the northern part of Wisconsin covered with naked rocks and let it be subjected to the atmospheric agencies for an indefinite term of years, and you will have the rocks broken down into a loose earthy mass. The rain-water seeps into the rock, and the breaking-down of that rock simply means that certain constituent elements are separated from the minerals which compose that rock and are carried off by the underground water. That part of the rock which remains is known as a residual clay, provided the rock originally contains the clay constituent.

In a great many cases the small particles that have been broken from the different rocks which cover the surface of the earth are picked up by the water which flows off from the surface, and carried into the streams and by them into the oceans, lakes or flood plains of the streams, and there deposited. These particles are sorted out according to their size and specific gravity, particles of life size and the same specific gravity being accumulated in one place. Thus we have accumulations of sand, gravel and clay as a result of the transportation. These are deposits formed out of the products of the breaking down of the rocks that have been carried to some distant point and there deposited.

Thus it is that we distinguish the two classes of clays, based entirely upon their origin, the residual clays which result purely from the decomposition of the rocks in place, and transported clays, those which have been carried away and deposited in new locality.

We have representatives of both of these classes of clays in Wisconsin, and will attempt at this point to give you some illustrations of these classes of clays as they occur in Wisconsin. I am not going to subdivide this classification because you would not carry it in your mind, and it would be of little or no importance to you.

The residual clays are best represented in Wisconsin in the southwestern part of the state, the portion which is represented by the purple color on the map which is hanging before the window. The residual clays are also indicated by the irregular green colored area in the central part of the state. The residual clays in these two sections of the state differ very materially in their characteristics. I do not wish you to infer from this that in these two sections transported clays do not occur, because the two kinds of clay often occur associated with each other. I simply mean by this map that the predominant clays of any value in the areas indicated are residual. Our friend Mr. Ringle of Wassau is working mainly a residual clay, and our friend from Grand Rapids Mr. Hamilton, and Mr. Bright from Black River Falls, these men are all working residual clays. The residual clays of this area, as I have said, differ very materially from those in the southeastern part of the state, and if we go to Platteville we will find Mr. Grindell working a very different clay, and yet it is residual clay.

Now, the question arises as to what causes the difference in the composition of the residual clay in these two different sections of the state. The composition of the residual clay depends upon the composition of the rock which immediately underlies that clay, and from which it has been derived. We find that in the southwestern part of the state the predominant rock is limestone although there are areas of sandstone throughout the entire region. Limestone does not consist entirely of calcium and magnesium carbonate, but is combined with iron oxide, quartz, kaolin, potash, soda and other minerals. Through the decomposition or breaking down of the limestone rock, which predominates in that section of the state, the calcium and magnesium are taken into solution and largely removed. Calcium and magnesium are the two elements which are most readily taken into solution. These are removed, leaving behind a mixture of kaolin, quartz, iron oxide, potash, soda, a little titanium, and some manganese, in various proportions constituting the residual clay of the southwestern counties of the state.

In contradistinction to the clays of this southwestern region there are the clays of the central part of the state which are indicated on the map by the green. Here the underlying rocks are what I have explained to you as the igneous type, ordinarily known as granites, although they consist of a great variety of igneous rocks. These are primary rocks, and they contain greater percentages of kaolin than the limestones in the southwestern part of the state. In some areas in this central region they contain a large percentage of iron oxide, and the quartz, iron, oxide, kaolin, potash and sodium content varies with the different varieties of igneous rocks. Thus when we have two feet of rock decomposed in the central part of the state we have resulting therefrom a clay which contains as a rule a greater quantity of kaolin, a clay which is more liable to

contain a greater percentage of potash, soda and iron than that which results from the decomposition of the limestones in the southwestern part of the state.

In each of these cases however we can excavate through the clay down to the rock, finding as a rule, as we go down that the rock becomes less and less decomposed until it is hard and insufficiently decomposed to be utilized in the manufacture of clay wares. Those are typical examples of residual clays that occur in Wisconsin.

I do not think that it is necessary or appropriate for me to give you the chemical analyses of these clays. I omit this out of deference to Mr. Finnegan again. I will say, however, that in the little report which I have issued on Wisconsin clays and clay industries, these analyses are given, and you can have access to them any time you wish by requesting for report.

I will say, however, that the clays or shales of the central region have a percentage of aluminum as high as 21 per cent, something which is unheard of in the residual clays in the southwestern part of the state where the aluminum does not exceed 13 or 14 per cent.

The fact that these clays in Central Wisconsin contain such a high percentage of aluminum makes them stronger than those in the southwestern part of the state.

Let us turn for a moment now to the transported clays, which are perhaps the most important source of material for the manufacturer of clays in Wisconsin. First however I must explain that at one time the entire northern, eastern, southeastern and southwestern portions of Wisconsin wre probably covered with residual clays resembling very closely those which are found now in the southwestern and central parts of the state. And if I should go further into ancient history I would tell you that after this decomposition took place the country was visited with an enormous ice sheet and the residual clays which occurred in the northern part of the state and throughout the eastern and southeastern portions were removed—were simply swept from the surface of the rocks and carried away. All the results of this early decomposition were practically removed. So we find that throughout the area which is indicated by the pink and brown on the map,—throughout this vast region we find no residual clays which are suitable for the manufacture of clay wares all of the important deposits being the result of transportation and known as transported deposits.

I will now call attention to this region which is indicated by pink on the map; this great north central region of Wisconsin. Here we find clays which are the result of the transportation and melting of ice. The ice carried material in its body in a manner in many respects similar to the way in which water carries sand, silt and gravel, and we have great thicknesses of deposits resulting from the presence of the ice sheet. We also have in this region old stream channels in which the water which came from the melting glacier deposited great thicknesses of clay. Following the incursion of the ice sheet, the country was very largely covered with water, and the stream channels flooded. Along these stream channels we find in various places considerable deposits of clay. These deposits can be examined at Tomahawk, Medford, Whittlesey, and many other localities. So we have two kinds of clays being worked in this great central region, two kinds of transported clays; those which have been deposited by the ice and those which have been deposited by the water.

What is the difference between these two clays? The ice alone was a very good transporter of clays, but not a very good assorter; that is the ice does not have the capacity of assorting and rearranging the materials, depositing the fine particles in one place and the boulders, pebbles and gravel in another. So where the brick manufacturers in north central Wisconsin are working what are known as ice-deposited clays we find them shoveling around boulders, which they are obliged to leave in the fields or carry away. They shovel the clay from between the boulders—and if you should take a trip through that section of the state you will find quite a number of yards mining their clay from a bed of two or three feet at the surface, and shoveling it from between the boulders which were deposited by the ice. We find an entirely different condition of affairs when we go to Menominee or Tomahawk, where the clay has a thickness of 40 or 50 ft. The deposits, however, were formed by the rivers, in which the sediments had been assorted and from which the boulders, gravel and other fragments had been removed. Through this region we find an abundance of very excellent stream-deposited clay.

The stream deposits of this region differ very materially from the deposits which are found along the streams in other parts of the state. The reason for this is found in the fact that the source of the materials were different. Throughout the central region the clay materials have not been derived from limestone rocks, but very largely from granitic rocks. These rocks have contributed very small percentages of calcium and magnesium to the clays, so little that the men who are working in the central and north central part of Wisconsin are not troubled with the excessive temperature required to burn the calcium and magnesium clays of the lake region.

We find, however, that in this region throughout central Wisconsin, the clays contain a considerable percentage of iron oxide and a very low percentage of calcium and magnesium, and the two are combined in such proportions in the clays of the central region as to permit the burning of only a red-colored brick. As far as my experience goes, the cream-colored brick manufacturers of Wisconsin need never have any fear from competition in the cream-colored brick business from the brick manufacturers of that section. I would make an exception to that rule,—perhaps in the region which is colored green on the map, where the white clays occur, a white brick may sometime be manufactured. But in this case the white color of the brick will not be due to the presence of high percentages of calcium and magnesium, but to the absence of iron, the freedom of the clay from iron oxide.

Turning our attention to the eastern and southeastern portions of the state we find a region where glacial action has been very pronounced, and in which transportation and assortment by the rivers and lakes has been very active. The source of the materials which constitute the clays in this portion of the state is the same as it is in the southwestern portion. The clays have been derived from the limestones which occur through out the eastern part of Wisconsin, but they have been derived in a different manner. They have not resulted from the decomposition of the minerals which compose the clay with the removal of the soluble constituents; but they have been the result of the mechanical breaking down and pulverizing of the rock. The clay resulting from the disintegration of the limestone has been mixed with materials brought in by the glaciers from the north. The limestone has been broken down into small particles resembling fine sand or silt, and this limestone powder has been mixed all through the clays which occur in the eastern and southeastern portions of Wisconsin. The limestone has been broken down mechanically, and not chemically. It is for this reason that the clays in the southeastern and eastern portions of the state contain by analysis such large percentages of calcium and magnesium.

At the close of the incursion of the ice sheet it is supposed that the entire eastern portion of the state, the portion which is indicated on the map by the dark brown color, was completely submerged by an extension of Lake Michigan. It is also supposed that the rivers which flowed into Lake Michigan and into Green Bay were very greatly extended, that the stream channels were filled with water, and that in these quiet estuaries of the rivers and along the shores of the lake were deposited the clays which are now being worked by the brick manufacturers of the eastern part of the state. The clays which occur at Manitowoc, Port Washington,

Sheboygan, Milwaukee, Racine and Kenosha, were all deposited in water which at one time constituted a part of Lake Michigan. The clays which are being worked at Merrimac, Jefferson, Endeavor, Burlington, and Edgerton, were deposited in the estuaries of the streams which flowed to the east and southeast. Thus it is that these great thicknesses of clays, composed of material resulting from the disintegration of the limestone mixed with decomposed material brought in by the glaciers from farther to the north, have been formed.

There is only one other area in the state, which I need to call attention to, and that is the region indicated by the brown color in the northern part of the state. Not only was Lake Michigan extended during the close of the glacial period, but Lake Superior likewise covered a larger territory than it does at the present time. Consequently deposits of clays formed, which are similar in many respects, to those which occur along the shore of Lake Michigan. The important difference, however, is this,—that the clays were not as thoroughly assorted, the pebbles were not as carefully removed from the clay deposits as they have been in the eastern and southeastern portions of the state. It is consequently a much more difficult matter to find a workable deposit of clay in this region which is free from the limestone gravel. The limestone gravel in these deposits came from the northern peninsula of Michigan, and perhaps further to the north where deposits of marble occur. The breaking down of the marble by the glaciers to the north and northeast has contributed calcium and magnesium to these deposits and made the working of them a very difficult matter.

There is still another small area which I think I should mention in this discussion, and that is the little area indicated on the map by light green and situated in the eastern part of St. Croix County. At this place there is a deposit of pure white clay extending in patches over an area 25 miles long by 12 wide. I have examined numerous deposits of clay in this region which are pure white; containing practically no iron, very little calcium, and very little potash. These deposits are unique and exceptional, but the explanation of their origin I prefer to leave until another time. I know that they come under the head of transported clays, and I think it is very probable that they had their origin in the decomposed granite rocks which occur north of the area in which they are found at the present time.

I might say with reference to this 'kaolin that it has been tested not only by the geological survey, but also by porcelain manufacturers, and these tests indicate that it is one of the very best clays that is found anywhere in the United States,—that it is a superior clay for the manufacture of porcelain and the very finest kind of art wares. The clay has been used, as you know, in the manufacture of paper, where the very highest grade of clay is required. Until recently the paper manufacturers of Wisconsin imported their clays, thinking that the home product was not sufficiently pure for that purpose, but now conditions have changed. If the clay is suitable for the paper manufacturing industry this is in itself prima facie evidence that it is a clay sufficiently pure as far as chemical composition is concerned to be utilized in the manufacture of porcelain ware.

I wish to say a word or two with reference to the future possibilities of the clays of Wisconsin as they have presented themselves to me from the little study I have given them. The clay working industries of Wisconsin, I am happy to say, are looking forward to the time when they can manufacture something outside of a building brick; that there are financial interests in the state ready to take up the development of any clays in the state which have been demonstrated to be suitable for the manufacture of other clay products. We were informed yesterday in the paper which our friend Mr. Clas read that there are great quantities of building materials imported into Wisconsin, none of which are manufactured in this state. That the question as to whether these clay products can be produced economically and with success in this state should be investigated, there ought to be no question.

Perhaps the question which has come to me more than any other is the question of the manufacture of paving brick. I have had a great many inquiries from brick manufacturers and from people who are interested in the development of the resources of this state, as to whether there were deposits of clay in Wisconsin which could be utilized for the manufacture of paving brick. Along with paving brick of course comes the manufacture of sewer-pipe and other vitrified wares such as electrical conduits. I wish to say in this connection that I do not anticipate ever having the pleasure of seeing a successful paving brick plant as now understood established in the eastern or southeastern part of Wisconsin. I think that any one who has taken the time or the opportunity to investigate the characteristics of the clays which are being used throughout the country, there is not the least probability that vitrified brick or sewer pipe can be manufactured in the region which is represented by the brown colored part of the map in the eastern or southeastern part of the state.

If I were to offer a suggestion to you I would ask you to relieve yourselves of serious thought along this line—turn your attention to the manufacture of wares which do not require vitrification. Give your attention to drain tile, brick earthen-ware products, many of which are not manufactured at the present time in Wisconsin, and the manufacture of building blocks. Direct your attention into those avenues which experience throughout the country has shown that calcium clays are suitable for. Do not devote your time to experiments along those lines in which experience has shown such investigation to be practically without compensation.

In the southwestern part of the state the clays differ somewhat in general characteristics, but as far as my experience goes I have not found in this region a clay which corresponds in its characteristics to the clays and shales which are manufactured into vitrified wares in other sections of the country. I might say, speaking scientifically, that the aluminum content is too low. Thirteen or fourteen per cent of aluminum in the form of kaolin is not sufficient to manufacture a first-class paving brick, and I am sure that no one in Wisconsin would care to undertake an enterprise in which they could not turn out the very best product that could be placed on the market. With the rigid inspection which is now given to wares of this kind, which are required to withstand the inspection not only of the engineer of the city but of every man, woman and child that passes over the thoroughfare, no man can risk his money or his capital in an investment, the success of which is questionable. You who live in the region marked with the purple color, to you also I would say, turn your attention to some other avenue.

In the central region which is represented by the pink the characteristics of the clay approach more nearly that which is required for vitrified ware, and yet there is still the question whether an amount equal to 15 or 16 per cent of aluminum is sufficient for the manufacture of this kind of wares, and if I were to give an opinion on this region I would say that as far as our experience and investigation goes,—and it has not covered that entire region by any means,—there are thousands and thousands of acres of land that have never been examined, about which very little is known. I say as far as experience goes the clays does not offer the ideal characteristics for the manufacture of these kind of wares. The same may be said in respect to the region bordering on Lake Superior.

The only region which I have in mind today which offers possibilities for the manufacture of vitrified ware is that in the central part of Wisconsin. This region, which is known as the kaolinic shale region of central Wisconsin, contains clays which correspond not only in their chemical composition but in their physical charac-

teristics to the clays which are used for the manufacture of vitrified wares.

West of these shales occur a few deposits of plastic clay, which also has the physical and chemical characteristics of the clays which are used in the manufacture of vitrified wares.

I want to discuss a step farther this subject of the manufacture of vitrified wares. I want to call your attention to the fuel problem. You must take into consideration the problem of fuel when considering the establishment of plants for an industry of this kind. When you have once found a deposit of clay or shale which is suitable in all respects for the manufacture of vitrified wares, you must then carefully consider, before erecting your plant, the cost of operating and the cost of burning the clays. I would caution you about doing as one of our friends did in Menominee, where he erected a plant, constructed his kilns, bought his machinery—and when it was completed found that he didn't have enough clay to run the plant. Such mistakes seem absurd, and yet they are common.

I have taken now more of your time than I had expected to, and am going to close this paper. I could talk to you from now until this afternoon on this subject, but know that you must be getting tired. I regret very much that my knowledge of Wisconsin clays is so limited; I feel that it is limited; that there is an exceedingly important field in Wisconsin for further investigation; that the investigation of the clay resources of Wisconsin has only begun, and that none of us, not I myself, am capable of contemplating the future development of Wisconsin's clay resources.

Because I have cast a shadow of a doubt on the possibility of manufacturing paving bricks and sewer pipe out of the calcium clays does not mean that there are not many different avenues in which these clays can be used. You do not know, manufacturers of eastern and southeastern Wisconsin, the uses to which the calcium, magnesium clays can be put. They are many and varied, and it behooves you to look forward to a time when you will have along side your brick plants other structures manufacturing different wares out of the same clays.

The President: I wish to express on behalf of the Association our appreciation for this able work that Prof. Buckley has given us. It surely gives us somewhat of an idea as far as we can grasp it, of the immense possibilities that are before the clay workers of this state.

QUESTION BOX.

The Secretary: I should judge from the number of questions which I had received that no one is having any difficulty in the manufacture of clay wares in Wisconsin; that every one is satisfied and that things are moving on perfectly.

I have one question which was sent to me. The gentleman who sent the question is not present and I don't know that it will be of any value to attempt to answer the question; however, I will place it before the convention.

"As the time of the convention is near, and I have a question to ask, I write you. I was bothered last summer with the molds, couldn't get the mud to slip out. I was also bothered with the brick cracking on the yard, and the only way I could stop it was to use lots of sand, but I was afraid the sand would make the brick tender. Now I would like to know how it is best to handle sand to get best results and best quality of brick?"

This is from Mr. Post of Spring Green. Mr. Post is working a residual clay, which is covered with about a foot or a foot and a half of black humus soil at the surface. He has been mixing about a spadeful of this black soil with a spadeful and a half or two of his clay, as near as I have it in mind. He dries his brick in hacks on the yard and burns them in scove kilns. The questions which he has asked are "how can he prevent the clay from sticking in the molds," and "how can he prevent the cracking of the brick in drying." As far as the matter of molds is concerned I am not competent to answer that question. I think it is very probable that his molds are not properly constructed. They may not be properly cleaned, or that his sander may not work properly, although I think that his molds are sanded by hand. Regarding the cracking of the brick on the yard, I attribute that very largely to the mixing of too much black soil with the clay and to the manner of drying. I think that these are the two main reasons for his brick cracking as they do. If anyone else has anything to say with regard to the character of the molds we would be glad to hear from them. Someone may also have some suggestions with respect to the cause for the brick cracking while drying.

Mr. Finnegan: I would like to help him out, but the only way I could fix him up is to move him into the Fox River Valley and let him move the whole business up there and we will go right around to his yard every day and help him out.

Mr. Chase: I think it has been the experience of a great many brick manufacturers to have difficulties in getting the brick out of the molds, at times, and I think in a number of cases it is largely owing to the quality of the sand that is used for sanding the molds. If we should use at our factory a gritty sand or anything like the lake sand found here, we could not begin to get them to slip. We use a very fine soft sand, almost like flour, and with that we get our brick to slip readily out of the molds. It may be that this gentleman has the same difficulty, and it may be attributed to the same cause. So far as cracking is concerned that may arise from improper pulverizing of the clay; it may be caused from small hard lumps that have not been soaked. If he uses a pug-mill he may be able to overcome this difficulty by thoroughly pulverizing his clay. I think these are two difficulties with which we have had more or less experience in our Milwaukee clays.

Mr. Ringle: The slipping part may be remedied if they have sufficient sand, so that the mold is very easily taken off, and you will find that those don't crack; there are others which will be badly cracked.

Mr. Sanborn: I will say that was the trouble we had years ago with the machines from New York; the brick would not slip and we were finally compelled to throw out the machine. We used the same sand which we now use in hand molding. In our case the trouble was certainly not with the sand, but we were never able to determine just where the trouble came in.

Mr. Randall suggested that as there was now in the treasury a sum greater than necessary to defray immediate expenses, the association should bear the cost of the stenographic report and printing the proceedings. It was pointed out by the secretary that there had been a clear understanding that the trade papers would bear the cost of the stenographic report this year. On motion of Mr. Hinkley the matter of reports of future meetings was referred to the executive committee.

REPORT OF COMMITTEE ON NOMINATIONS.

Mr. Finnegan: I have the honor to say to you that the men we picked out are the best men in the state for the best organization in the United States.

For President, Maj. J. W. Hinkley, of Green Bay;

For Vice-President, William Meadows, of Burlington;

For Secretary, Geo. J. Schwarz, of Milwaukee;

For Treasurer, J. G. Hamilton, of Grand Rapids.

The President: You have heard the report of your Nominating Committee. What is your pleasure in regard to the first one on the list, Maj. J. W. Hinkley of Green Bay, for president.

Proper motions being carried the secretary cast the ballot of this convention for each of the nominees.

Maj. Hinkley: Mr. President and Gentlemen of the Convention: I think perhaps that the same rule and the same reasons which I gave for deferring that other matter, the lateness of the hour, would prevent my making any lengthy remarks, but I simply thank you for the honor which you have conferred and which I fully appreciate. I think it is an office like the presidency of the United States, it should neither be sought after nor declined, and for that reason I accept with thanks.

REPORT OF COMMITTEE ON NOMINATIONS.

Mr. J. B. Thierault, Chairman, submitted the following report:

This committee reports that in view of the successful execution of the most enjoyable and helpful convention it has been its lot to attend, that it be—

Resolved—First, that the thanks of this Association be tendered to the brickmakers of Milwaukee for their most generous hospiality.

Second, That we express our sincere appreciation of the presence of the ladies at our banquet and the hope that future years may see an increase in their interest and attendance.

Third, That the Association tenders its thanks to its officers for the past year for efficient and conscientious service rendered.

Fourth, That the Association received with deepest gratification the cordial welcome of Mayor Rose to the Cream City.

Fifth, That the Association extend its thanks to the press of Milwaukee for the appreciative mention of the proceedings of our Convention.

Sixth, Furthermore, that this Association desires to express by a rising vote of thanks its acknowledgment of the heavy debt of gratitude due to E. R. Buckley, of Rolla, Mo., for the excellent organization we now possess and also its regret for the enforced transfer of Mr. Buckley from our beloved state to Missouri.

Seventh, That the thanks of this Association be expressed to all those who so efficiently added in our evening's enjoyment.

Eighth, That this Association hopes that the members who have travelled so far to meet with us will do all in their power to swell our numbers at the next annual convention.

On motion the resolutions were adopted.

The President: After we have adopted the report that brings with it the rising vote of the Association for the sentiment that is in all of our hearts and that is expressed in the resolution, I know that anything that we can do and the only thing we can do, and that which will be appreciated most by our brother who during the last few years has worked so efficiently for the clayworking industries of this state, is to give him this expression of our appreciation of his labor, and that as years come and go and he is enforced to be absent from us he may carry this with him, that in the hearts of the brick-makers of the Badger State he holds a near and dear place, and I ask you all as a testament to him to arise.

The convention then arose.

Mr. Buckley: Mr. President, and Gentlemen: I am much more capable of discussing the clays of Wisconsin than I am of expressing the feeling which come to me from such a testimony of appreciation as that which has just been passed by this association. I can simply reiterate what our President, Mr. Drake, has said, that I can receive no better pay—that nothing gives me greater pleasure and satisfaction,—and there is nothing that will abide with me longer or give me greater pleasure in the years to come—than a knowledge of the fact so eloquently expressed in this resolution that the feeble efforts which I have put forth in the investigation of the clays of Wisconsin have been appreciated by those in whose interest they were conducted. I wish to thank you again for every assistance and help which you have rendered me. All the success which has crowned my efforts has only been possible through the cooperation of every person who is present in this room today.

I will repeat what I said last evening at the banquet, that although absent in body, I am with you in mind; and that wherever I am, if I can be of any service to the clayworkers of Wisconsin, today, tomorrow or at any future time, I hope that they will feel entirely at liberty to call on me. Anything that I can do whether it be to write reports, perform clerical work, do anything which I am capable of doing, I shall consider it an honor to perform those duties for the association. Please accept my sincere thanks for this token of your high appreciation.

The President: I think the association would like to hear from our new secretary.

Mr. Schwarz: Mr. Chairman and Gentlemen: When we first came into this room our chairman talked about veteran warriors—I think he must have referred to me. I think I have fought very hard for this office and I don't think I ought to thank you; I think I have done it all myself; I think I canvassed every vote. However, seriously speaking, as inefficient as I think myself to be, I will endeavor to do all in my power to fill this office as well as I know how. I thank you.

The President: We would be glad to hear from our new vice-president, Mr. Meadows.

Mr. Meadows: Mr. President, I have simply nothing to say. I asked the convention one request, and they failed to grant it—now it is my turn.

The President: We will be glad to hear from our new treasurer.

Mr. Hamilton: I can hardly find words with which to express my gratification to the members of the nominating committee and the members of the convention for electing me to the responsible position of treasurer of this association. I feel as if this office and the honor which accompanies it should have been tendered to some of the older and more active member of this association. But since it is the wish of the association that I should accept the position I thank you for it and assure you that I shall endeavor to carry out the duties of the office to the best of my ability.

THE NEXT MEETING.

Mr. Hinckley, chairman of the committee on the time and place of the next meeting, read invitations from the mayor of Green Bay and the Business Men's Association of that city, and then reported that the committee was unanimously in favor of choosing Green Bay as the place of the next meeting, and requested an expression of opinion as to holding the convention in October.

After some debate it was decided that brickmakers are too busy in October to attend conventions.

Green Bay, Wis., was chosen as the place, and the time fixed for the latter part of January or the first part of February, 1903, the exact date being left to the executive committee.

The convention then adjourned sine die.

The Villisca (La.) Brick & Tile Co. is resetting its machinery and effecting other improvements preparatory to early spring work.

The Trimble (O.) Brick Co., a new corporation, has elected the following officers: F. M. Koons, of Columbus, president; C. H. Pettit, of Trimble, vice-president; C. W. Wilson, of Trimble, secretary; D. Edwards, of Glauster, treasurer, and W. H. Hyde, of Trimble, superintendent.

The Metropolitan Paving Brick Co., of Canton, O., has acquired the two brick plants of the Canton & Cleveland Brick Co., located at Canton and Willow, and will soon begin the erection of a new plant which will have a capacity of 100,000 brick per day, and employ 175 men. Warren E. Keplinger is president of the Metropolitan company.

Progress of the Good Roads Movement.

The National Good Roads Association and the Jefferson Memorial Road Association, assisted by the officials of the Public Road Inquiries and the Department of Agriculture, have arranged for a Jefferson Memorial and Interstate Good Roads convention to be held at Charlottesville, W. Va., Apr. 2, 3 and 4, 1902. The Southern Railway has provided a Good Roads special train which will carry 22 engineers and road experts and will be equipped with 15 car loads of the latest improved road making machinery. This magnificent train will arrive at Charlottesville, on March 24th and will begin the construction of the Jefferson Memorial road. This road will extend from Charlottesville, W. Va., to the home and tomb of Thomas Jefferson at Monticello, a distance of about 2½ miles. The old road was a bridle path and in the last hundred years has widened so as to make a narrow roadway which is extremely difficult and dangerous to travel on, in many places the grade being 16 ft. in 100 ft. A desirable road has therefore to be constructed and this will be done in time for the convention. General Fitzhugh Lee, the president of the Jefferson Memorial Associataion, and Governor A. G. Montague, of Virginia, will give welcome to those who attend the convention and the convention will be addressed by the Hon. John W. Daniel and the Hon. Thomas S. Martin, United States Senator from Virginia. Many other notable speakers will be there and we hope that the success which has crowned the efforts of the National Good Roads Association in every enterprise that it has undertaken since its organization will be noticeable in this forthcoming convention at Charlottesville.

The Death of Henry Martin.

It is with regret that we announce to our readers the passing away of another prominent figure in the annals of brick machine manufacturing history. But a short time ago we recorded the demise of S. S. Chisholm, and now we have to announce the death of Henry Martin, of the Henry Martin Brick Machine Manufacturing Company, Lancaster, Pa. The news cannot be said to be unexpected for Mr. Martin has been confined to his room for some considerable time past, being in very poor health. His death, however, comes with none the less regret, for Mr. Martin has acquired a wide circle of friends made by his sterling merits and genial presence.

The deceased was born in Derbyshire, England, in 1832, but was reared and educated in Staffordshire, that home of the potter and the workers in clay by every process known to man. His father was George Martin, a mechanic, and Henry Martin was blessed with eight brothers and sisters. Henry Martin learned as his first trades those of millwright and carpenter and then went to work in a large English brickyard, working there till the age of 17. Here he gained his first knowledge of brickmaking, the machinery then employed in their manufacture and also an insight into the possibilities of profitable reform in this field. During the next three years Mr. Martin spent the time wisely in a builder's establishment at Birmingham, where he mastered the technique of the carpenter's trade and shortly after removed to Liverpool. In this city he set himself the task of carving out for himself an education which should serve him in good stead for his life's work, and the evenings he spent in the study rooms of Y. M. C. A. and learned there drawing and improved himself in mathematics.

In 1858 he left his native shores and removed to Boston, Mass., subsequently going to Hartford, Conn., where he was married to Miss Anne Wood, who died in the 60's leaving one son, George H. Martin. During the war he was employed at the Springfield Armory, where he acquired his practical knowledge of machinery and there finished his model of a good and effective brickmaking machine. This was placed on the market in New York, but for several reasons the enterprise was not a success, and in 1873 Mr. Martin and all those interested with him lost all they had invested.

Nothing daunted Mr. Martin went to Lancaster, Pa., and commenced in the same business anew and this time with perfect success, for in a short time the Henry Martin Brick Machine Manufacturing Co. was organized with a capital stock of $150,000 and the company has now a fine plant on Charlotte St. The business will be continued under the management of his sons, who have for many years been actively engaged in the enterprises of the

HENRY MARTIN.

plant. W. R. Martin is the business manager of the plant, and no one was ever better fitted to occupy such an arduous post. The other brothers each have their special place in contributing to the success of the company, and there is no doubt that the Henry Martin products will continue to advance in public favor as they have done in the past.

Mr. Martin died at his home, 139 East Chestnut St., Lancaster, Pa., on March 4th, and was buried on the 7th at the Woodward Hill cemetery. Among the many devices which are the result of the ingenuity and careful planning of Mr. Martin and which have been of permanent service to the clayworker may be mentioned the rack and pallet system of drying now so much employed by the brickmaking fraternity.

The Underfeed Stoker Co., of Chicago, has installed eight new mechanical stokers in the yards of the Purington Brick Co. at Galesburg, Ill.

The Columbia Brick Co., whose plant near Lake City, Fla., was recently destroyed by fire, is making rapid progress on the erection of new buildings and has purchased a new outfit of machinery. The new plant will be put in operation early in December.

The Youngren Gas-Fired Continuous Kiln.

"Brick" Maintains a Continuous Standard of Merit.

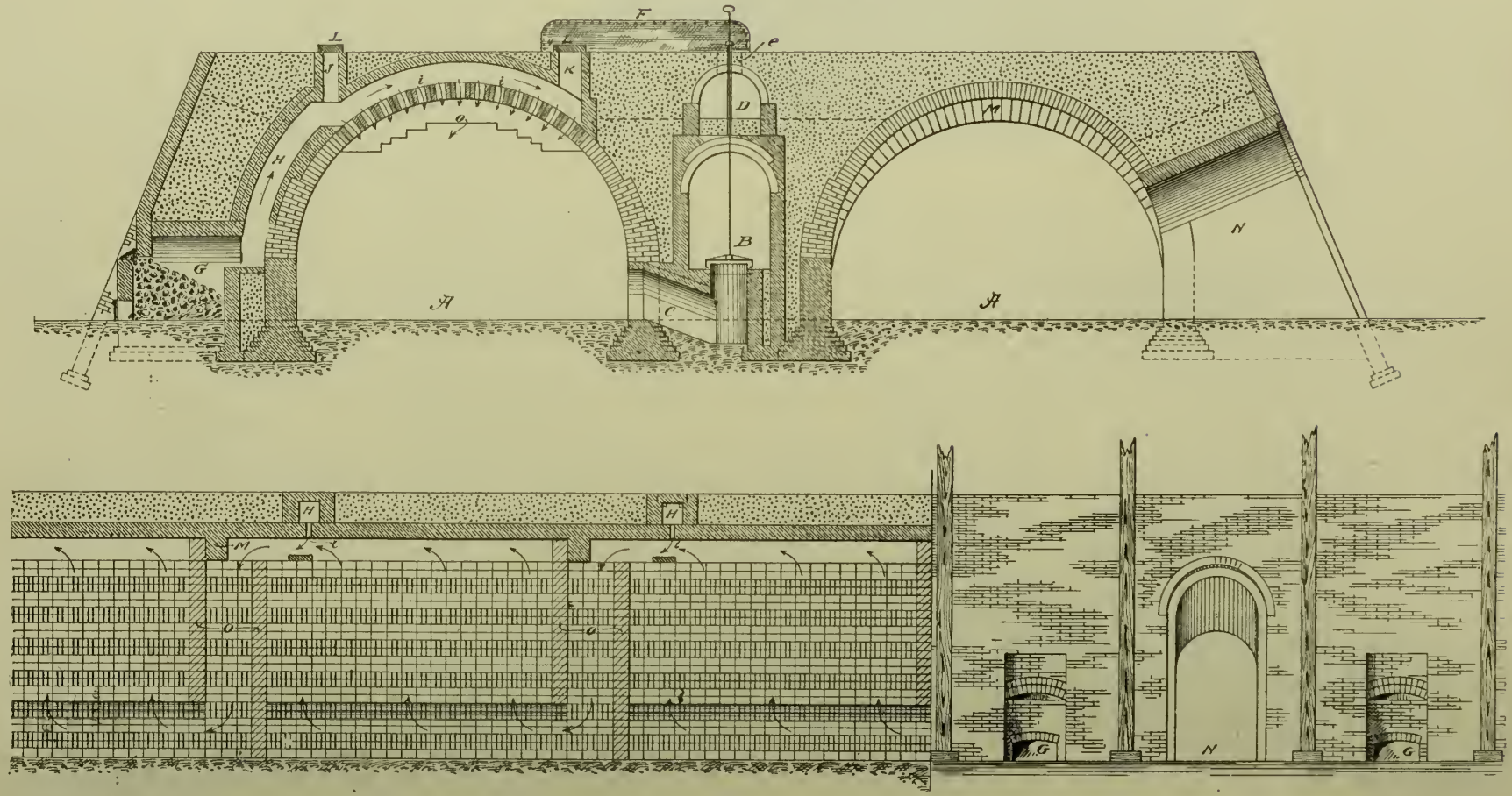
So much has been said and written about the unsuccessful operation of continuous kilns, and the various causes contributing to their failure on this side of the Atlantic that it will no doubt be interesting to the readers of "Brick" to hear about a continuous kiln that is being operated with unqualified success; burning a material that is conceded to be the most difficult burning clay in the country.

This kiln is in operation on the west side yard of Burnham Bros., Milwaukee, Wis., and was visited by a large number of brickmakers during the convention of the Wisconsin Clay Workers' Association held in Michigan last January.

In a paper relating to "The Minimum Cost of Burning Cream Colored Brick from Wisconsin Calcium Clays and How It Is Accomplished," read by P. L. Youngren at this convention, the extraordinary conditions required in the burning of the highly calcareous clays of Milwaukee and the cause of the enormous fuel consumption in the old system of burning was clearly set forth.

The Milwaukee brickmakers have deeply felt the want of a more economical system of burning their brick in order to ward off competition from quarters, not far distant, where nature has provided the brickmaker with an extremely easy burning clay. It is a remarkable fact that these two extremes are found within less than 100 miles of one another and that in one place a kiln of brick can be watersmoked and burned in 72 hours while it requires from 15 to 18 days to burn a kiln in the other place.

In 1894 the Standard Brick Co. of Milwaukee erected a continuous kiln at considerable expense, but after several unsuccessful attempts to burn the brick the kiln was abandoned and the con-



TRANSVERSE SECTIONS, LONGITUDINAL SECTION AND SIDE ELEVATION OF YOUNGREN CONTINUOUS KILN.

tinuous kiln was marked down as a dismal failure as far as burning Milwaukee clay was concerned.

The strong pressure of competition was, however, sufficiently great to cause the Milwaukee Brick Co. to venture a trial with another continuous kiln, in reality a duplicate of the one erected by the Standard Brick Co. and embodying the same method of fuel application, the only difference being in the name of the builder, and the results were about identical in both cases. Both these kilns are modifications of the Hoffmann kiln and were fired with coal screenings dropped through the arch down among the brick, and their failure is attributed to the small latitude between the proper burning heat and the point of total collapse of the highly calcareous clay, under the influence of the oxidizing atmosphere generally prevailing in a continuous kiln.

In the Youngren continuous kiln erected by Burnham Bros., an innovation in the method of fuel application and setting of the brick has beeen introduced, and judging from the statements of the proprietors as well as from the "Brick" representative's personal inspection of the kiln and its output, the system is a decided success.

The "modus operandi" of the kiln may best be understood by perusal of Mr. Youngren's paper (p. 146, March) and by reference to the accompanying transverse and longitudinal sections of the kiln.

In the drawings, A—A denote the two parallel burning tunnels, connected at their ends and forming, when set full, 18 up and down-draft compartments. B is the main draft flue in communication with a central stack 120 ft. high, of 6 ft. diameter.

Each of the 18 kiln sections is provided with a damper-controlled branch draft flue C by means of which any section can be put in communication with the main draft flue, D, a main hot air flue which is provided with upward extensions, e, and arranged to be put in communication with any kiln compartment by means of the sheet-iron conductor F.

Generators or furnaces are at G, from which the partly consumed gases are led through the up-take H up over the main arch and thence into the kiln through the openings i, at a point where the entire draft through the kiln is concentrated in passing over the lower deflecting wall. O, O are deflecting walls which are formed with the raw brick in setting. One of these walls deflects the draft upward and the other downward as shown by the arrows. The upper deflecting walls is set against the drop arch, M, which maintains a close barrier and allows the wall to settle or shrink without detriment to its functions.

K is an extension of the gas flue by means of which the compartment is put in communication with the main hot air flue. J is an opening in the gas flue through which a damper can be inserted to regulate the flow of gas. L, L are tile covers.

The main points of advantage claimed for the kiln are:

1. Clean and evenly-burned material.
2. Perfect control and even distribution of the heat.
3. Easy firing and less handling of the coal than ordinarily necessary on kilns of this class.
4. More convenient and handy setting, as there are absolutely no fireholes to form and no poles to set around.

In the next issue of "Brick" will be found a description of an illustration of the application of the semi-gas firing to the continuous compartment kiln, in which permanent partitions separate the compartments.

Judge Charles S. Reed, Grayson Mills, Claud DeWitt and H. W. Townsend, all of Sandusky, O., project erecting a large paving brick and firebrick manufactory in Norwalk, O., in the spring.

R. S. Braswell, a leading merchant of Fort Valley, Ga., has purchased 600 acres of superior clay lands seven miles west of Fort Valley, and has begun the erection of a large and modern brick manufactory.

Brick Notes En Route.

The Beaumont Brick Co., Ltd., now lists a capacity of 15,000,000 annually, and this is taxed to the utmost. The quality is very fair in comparison to the general run of Gulf Coast product and shipments from the outside. Local builders now demand a better quality of brick and it behooves the promoters of new Beaumont to also look after architectural beauty. This will necessitate importations from brick making or distributing centers that set the tone. There's room at Beaumont for a concern keeping the leading standards in stock though business may be facilitated by means of catalogs and samples.

The Crowley (La.) Brick Co., Ltd., in boring a well, struck a vein of building sand which is now being mined by special apparatus. The supply seems ample for all requirements and a good shipping trade may be developed.

Owing to the steady influx of Northerners and Easterners come to better their conditions in the new rice and oil belt, the demand for brick residences and business buildings is rapidly growing, evidences being at hand at all the S. P. R. R. brick making points, improvements toward meeting outside competition being rapidly made. The fire-visited towns are especially anxious to secure a more fireproof material and municipal fire regulations are being drafted in conformity therewith. The threatened withdrawal of various insurance companies from Texas has also been interpreted as to mean a more general submission to their rules and advices.

Long distances and corresponding freight rates debar many of the market seeking manufacturers east of the Mississippi to bid for the Southwestern trade ample though the opportunities be. Waterway competition via Port Arthur may better the situation. Houston, which is the gateway for several railroads reaching the great markets directly or by connection, as for instance, the Katy, might be chosen as the leading distributing center for the oil and rice region in purview. Its wholesale facilities are unmistakably the best between San Antonio and New Orleans.

The refinability of Texas-Louisiana fuel oil once tested, would no longer hinder the building of vast plants cognate thereto. Interested parties should not lose sight of these prospects.

Though drainage tile can be laid down at S. P. or Santa Fe points at fairly reasonable rates advisedly upon the leading producing sources being in need of this market, conditions seem to demand the establishment of at least one large plant at or in the vicinity of Beaumont, Tex.

Another season or two in rice affairs will render storage for longer periods a necessity. Such a condition would require something better in warehouses, and brick material seems to answer the purpose from an economic standpoint. The slapbang wooden structures would not further the quality of storage rice, product of damp soil though it be.

Bricklayers and helpers continue in ready want in the oil belt at ruling union wages. Send your surplus here, but be sure they are possessed of the practical views of brick merit.

Heretofore little or no attention has been paid to brick suitable to the marshy condition of the new oil and rice country as extraordinary laws of hygiene and sanitation have been overlooked in the excitement. These will obtrude in the sober days, and then they will remember there's such a thing as brick science.

The landmark brickyards are falling into ruins everywhere and everybody has come to look upon handmade brick as a mere technical term, the oldfashioned handmade article actually no longer cutting a figure.

Despite the majority of brick plant employes in the South being blacks, but few have as yet made their debut as owners. West of the Mississippi but one mentionable plant is owned by a negro and that is located at Lake Charles, La. The situation seems encouraging for Mexican and negro exploit.

OHIO VALLEY LETTER

FROM OUR SPECIAL CORRESPONDENT

The common brick business in Pittsburg is starting off this spring at a rate which betokens even an increase over last year's sales, which were the largest in the city's history. Notwithstanding the fact that spring has hardly begun, the output of some of the largest city plants is sold for two months ahead. At that rate it would appear that by the time the season is thoroughly opened the trouble will be to find bricks for the many large buildings that are contemplated. There are, however, quite a number of plants a few miles removed from the city from which bricks may be shipped for a very modest freight charge, and the surplus of such plants will, as a matter of course, find its way to the city market just as soon as it is discovered the demand cannot be supplied by manufacturers in the city. But even with that assistance it is scarcely possible, from the outlook, that common bricks will be found in sufficient quantities to meet all demands. While there are quite a number of red brick plants being built, which will be ready for operation at least by early summer, it is doubtful whether any of them are located close enough to Pittsburg to ship there at a profit, even were the owners so disposed, which is scarcely possible considering the fact that the new plants, at least those being equipped for the manufacture of common bricks, are located in communities which, it is safe to predict, will consume the entire output of each plant for a time at least. In view of these facts as they appear to my mind I believe I am safe in saying there is still room in Pittsburg for one or two additional red brick works, statements of local brickmakers to the contrary notwithstanding.

A man recently met death by a fall of slate from the roof in the clay mines of the West Virginia Clay Co., at New Cumberland, W. Va. This is the first casualty of the kind to occur in that neighborhood for some time, and there are perhaps a dozen fireclay mines there. As a rule the roof in these places is very good and considered quite safe under ordinary conditions. Immediately above and adjoining the fireclay is a thin vein of coal, running from two to three feet in thickness, and above the coal is found a vein of sandstone, many feet thick. The coal, which in some places is of an inferior quality, being filled with clay seams, is sometimes left standing in the mine after the clay is removed, and furnishes a very satisfactory roof. And when this is taken down, which is frequently the case, the sandstone roof also affords ample protection and rarely causes trouble or alarm, unless when a foreign substance is discovered such as "horseback," when the otherwise safe covering becomes very dangerous. It is not improbable that something of this character caused the death referred to, as there is a possibility of an accident of that sort occurring unbeknown to the miner, as the seams which cause it are sometimes hidden from view.

The Ohio Ceramic Engineering Co., of Cleveland, will furnish 130 steel cars of special design for the American Cement Tile Co's. plant in course of erection at Wampum, Pa.

The Atlas Bolt & Screw Co., of Cleveland, has received an order from the Hutchinson-Barns Brick Co., of Fairmont, W. Va., for 100 rack cars and about seven thousand steel pallet.

It is given out that a company will be formed by Pittsburgers to erect a plant for the manufacture of bricks from a mixture of sand and lime without burning. The following well-known business men are mentioned among those interested in the project: Jos. W. Marsh, secretary Standard Underground Cable Co.; A. G. Roenigk, president Pittsburg Building Co. This process of brickmaking is said to have been invented by Harry Huennnekes, of Germany, and is controlled in the United States by a New York firm. It is understood the Pittsburg parties mentioned have acquired the right to manufacture and sell the product in Ohio, Pennsylvania and West Virginia.

A drier is being built at the Pitcairn works of the J. M. Rumbaugh Brick Co., of Wilkinsburg, Pa., to take the place of the one recently destroyed by fire. The one being built is of the heated air variety and is being constructed on lines formulated by the owner of the works.

George A. Benney, who has been general manager for the American Clay Manufacturing Co., of Pittsburg, since its reorganization more than six months ago, has resigned to engage in other lines of work.

It is given out that a new combine styled the American Potteries Co. has been organized in New Jersey, and that the majority of East Liverpool pottery manufacturers will be identified with the new concern in the course of time. There are some thirty potteries in that place turning out a variety of ware including almost everything known to the trade in that line.

Three additional round, down-draft kilns have just been completed at the Great Western works of the American Sewer Pipe Co., located at Toronto, O. With this additional kiln capacity, judging from past records, the Great Western will possibly be capable of turning out a larger daily output of pipe than any other of the company's Ohio River plants. In fact, I am informed that for some years past this particular factory has produced more sewer pipe than any other in that neighborhood, notwithstanding the fact that some of the others are larger and apparently better equipped. At the Great Western plant, during a portion of the summer season, it is not an unusual practice to make, set and draw three kilns of pipe daily. While there are sewer pipe plants in this country a great deal larger than the one in question, and as a natural result turning out a greater day's run, I venture the assertion that the Great Western, considering its advantages and the age of the factory, can exhibit a record equal to the best if all reports are true.

It is now authoritatively announced that the Myers Clay Manufacturing Co., which firm I have previously mentioned as being engaged in opening a fireclay mine with a view to embarking in the clayworking business near Toronto, O., will build a sewer pipe factory, and that contracts have been awarded for the erection of the required buildings. The main structure for the plant is to be of frame, 80 ft. wide by 230 ft. long, three stories high, and in addition there is to be an annex 60 by 60 ft. There are to be ten down-draft kilns erected, and a start on all the work is to be made at once in order to have everything completed by July. It is understood a portion of the machinery has been purchased and that the Means Foundry Co., of Steubenville, O., will supply the grinding pans, also the tempering pans, together with other of the necessary equipment.

There appears to be quite a demand for building brick in and near McKeesport, Pa., incident to the extensive building operations under way, which are principally of an industrial character. Many

of the steel concerns in that nighborhood are enlarging their plants and some new ones are being built. It is said that one concern alone will soon be in the market for 5,000,000 common brick. As a result of this building boom all brick works in that locality are very busy and it is not improbable that another plant may be built there soon. In fact, such a thing is almost a necessity, as it is impossible for the few local manufacturers to supply the demand for brick, and a result great quantities of them are being shipped from a distance.

At Sharon, Pa., a new bricklayers' scale of wages has gone into effect granting the workmen an increase from $4 to $4.50 a day of 9 hours.

A new concern has been organized at Uhrichsville, O., known as the Oak Hill Sewer Pipe Co. The capital stock is placed at $30,000. Not a very high figure if the business of sewer pipe making is to be carried on very extensively.

A contract has been awarded to Ott Bros., of Pittsburg, to construct a sewage system in West Homestead, Pa., at a cost of $26,000. It is understood the work must be completed within three months.

An E. M. Freese & Co. automatic cutter has just been installed in the face building brick works of the Kittanning Pa. Brick & Fire Clay Co., also a similar machine has been placed in the Bolivar works of the Lincoln Fire Brick & Shape Co. It is understood the latter concern will embark in the face building brick business, but will, at the same time, continue to manufacture its present very complete line of fire bricks.

Plans have been completed for the new six-kiln pottery to be built at Salineville, O. The buildings will be of brick and the main structure will be 320 by 150 ft.

It is understood that Pittsburg capitalists are at the head of a company which will purchase and develop a large area of mineral territory in Lawrence County, Pa. The land to be acquired is said to be underlaid with rich deposits of limestone, coal and fireclay and it is the intention to operate all of these on an extensive scale. As the property is somewhat isolated it will become necessary to build a line of railroad for a considerable distance. It is understood operations will begin early in the summer.

The McFetridge Bros. red brick plant located near Tarentum, Pa., which passed through a fire lately, is being rapidly overhauled and will shortly be ready for resumption. The buildings in which were located engine, boilers and all the brickmaking machinery were entirely destroyed and the contents badly damaged. It was found that the boilers, engine, dry-pan and brick machine, with a certain amount of repairing, could be again brought into service. The pugmill was completely wrecked and an order has been placed with E. M. Freese & Co. for a new one which will be a compound geared machine with 12-ft. pugging chamber. The McFetridge plant has been in operation for a number of years and seems to have been a successful and profitable enterprise. The material used here is composed principally of hard shale and seems to make a very superior quality of red bricks. The kiln department of the plant consists of both up and down draft, mostly the former. There were, before the fire, two driers here, one of which was destroyed beyond recovery and the other remains standing, being apparently uninjured. These driers are of a design formulated by the owners of the plant and appear to be merely a hot floor with partition walls built on top and covered over. In addition to the brick business, McFetridge Bros. are also interested in a variety of other industries, including that of coal operating, in which business they are quite largely engaged.

A down-draft kiln is being built at the Fairchance, Pa., works of the Delaney Fire Brick Co.

At the works of the Allegheny Valley Brick Co., located near New Kensington, Pa., the first clamp kiln of bricks has just been burned and shows very satisfactory results. It is the intention of the company to begin at once the erection of a number of round down-draft kilns.

The late flood did considerable damage, and caused the loss of many thousands of dollars to pottery, brick and sewer pipe factories located along the Ohio river. Among the concerns to suffer most on this account were James Porter, Mack Manufacturing Co. (at several plants), the American Sewer Pipe Co. and Chelsea China Co., of New Cumberland, W. Va. Some of the American Sewer Pipe Co's. factories located on the west side of the river were also inundated and suffered considerable damage. Some other brick plants near Pittsburg were also flooded, notably that of the Kountz Bros. Co., at Harmarville, Pa.

There is some talk of another fire brick works being built at New Cumberland, W. Va., by local parties and citizens of the same town are also trying to get a second whiteware pottery located there, but there seems to have been nothing definite done yet in either case.

The Toronto (O.) Fire Clay Co. has purchased an additional 12-acre tract of fireclay lying adjacent to, and west of, it present holdings .

A new brick plant is soon to be built near East Liverpool, O., by Wellsville parties who have applied for a charter under the style of Champion Clay Co. The following names appear in the application: T. H. Silver, of the Silver Banking Co., Henry Cooper, Samuel Anderson, G. W. Adams, and J. Goetz. The capital stock is placed at $50,000. It is understood that Mr. Silver is the leading spirit in the enterprise. This gentleman has been engaged in the brick business for a period of years, having owned what is known as the Champion Brick Works, located in the lower part of Wellsville. I am informed that on account of the lack of material the old Champion plant is to be abandoned and that part of the machinery and apparatus will be removed to the new site. The majority of the machinery will, however, be purchased new, as it is the intention to install a large and well-equipped plant for the manufacture of stiff-mud bricks. Work on the new buildings will be started in the very near future.

A fire occurred at the Forest City works of the American Sewer Pipe Co., located at Toronto, O., which entirely destroyed the carpenter and machine shop, togetber with all its contents. The loss was possibly $1,500, and consisted principally in machine tools, including drill presses, lathe, etc. The destroyed building also contained a quantity of supplies which were also ruined. The origin of the fire is unknown.

The plant of the Glassport (Pa.) Brick Co. is running full time and has been in partial operation all winter. A fire occurred there about a month ago which did slight damage to the buildings, but did not injure the machinery to any great extent. This company is at present very busy, having really more orders than it can fill. Glassport is considered quite an enterprising little town and has possibly as large a share of industries as any place of its size in the Monongahela Valley.

G. R. Pierpont, owner of the Pierpont Brick Works, situate near Roanoke, Va., was in Pittsburg lately and while there visited a number of the local brick plants, also placed an order with the Pittsburg representatives of E. M. Freese & Co. for a large Union brick machine and an automatic cutting table. This new outfit was purchased to displace the soft-mud machinery which has been in use at that works for some years. Mr. Pierpont turns out about 35 M red bricks daily for which he finds ready sale in Roanoke and nearby towns.

The Pittsburg Consolidated Coal & Coke Co., of Pittsburg, mention of the organization of which has been made in the daily press, does not seem to have done anything as yet with reference to developing its fireclay territory located at New Galilee, Pa. This concern has been incorporated in New Jersey with a capital stock of $150,000 and claims to possess, in addition to its clay and coal

holdings at the place named, quite a vast acreage of coal territory both in West Virginia and Maryland. It is the expectation of the company to install an extensive brick plant at New Galilee for the manufacture of buff bricks, but it is not known at present when operations will be started.

Several additional down-draft kilns will be built at the Standard paving brick works, Empire, O. This plant has been in full operation all winter and has possibly turned out a greater output during the cold season than any other plant of its size on the Ohio river.

The plant of the Kane (Pa.) Brick Co. was closed two months during the winter season, during which time some changes and additions were made, the latter including a Richardson double-die repress. This concern has experienced quite a great deal of trouble on acount of insufficient power—a condition of things which is by no means uncommon among brickmakers. When the plant was built some two years ago a 75-h. p. gas engine was installed, but after this was used but a very short time, it was discovered to be inadequate to meet requirements. An additional 40-h. p. engine of the same pattern was then installed to drive the dry-pan, leaving the first and larger engine to operate the brick machine and small apparatus. These two engines were continued in use for a few months, possibly a year, but were not by any means satisfactory, so now these have been taken out and the company has installed in their stead a 180 h. p. double cylinder gas engine, which will certainly provide all the power required to operate the plant easily and satisfactorily and have plenty of surplus. I think I have previously in these letters expressed my views with reference to the adaptability of gas engines for brick manufacturing, and will not further discuss the subject at this time. But the experience of the Kane company serves to emphasize my arguments and that very forcibly, and I am still unalterably partial to the steam boiler process of furnishing power.

A considerable amount of street paving is being done at Morgantown, W. Va., the brick for which are being furnished by the local concern.

Another brick plant is being built at Washington, Pa., which will make the third enterprise of that character there, two of which will have started within a year. The last plant, however, from indications will possibly be the best one of the three, as I am informed it is to be equipped with all modern conveniences. The following persons are named as being among those interested in the new concern: James R. Mitchell, William Donley, A. M. McElroy, and R. H. Meloy, all of whom are residents of Washington. The style of the firm is Donley Brick Co., a name which has been identified with the brick industry in Washington county for three generations. The new plant is being built within the corporate limits of the town and is located on the B. & O. R. R., from which road a siding is being aid, thus assuring for the new company two ways of disposing of its product—locally in wagons and by railroad shipments. The work of erecting buildings is already under way. The entire equipment of this plant is being furnished by E. M. Freese & Co. and will include a short-stroke, slide-valve engine, cylinder 18 in. by 22 in. and one standard tubular boiler 150 h. p. One union brick machine with 50 M daily capacity and an automatic cutting table. One Stevenson 9-ft. iron frame dry-pan, also the necessary elevators, screens, shafting, pulleys and belting. A 5-tunnel Pittsburg hot air drier is also being built, the cars for which will be supplied by the Ohio Ceramic Engineering Co., of Cleveland. The kilns to be built will be of the open top pattern in which gas will be used as fuel. In fact it is the intention to use gas not only in the kilns, but also under boiler and in drier furnaces. The brick material here is a mixture of soft clay and shale and from appearances will be quite easy to operate and will make a very good quality of red building brick. The company has purchased a 50-acre tract of land, for which, on account of the desirability of its location, they paid a considerable figure. It is the purpose to push the plant to completion with all possible rapidity in order to have bricks on the market by early summer.

The American Sewer Pipe Co. has just completed quite a variety of improvements at its Blackhorse works at New Cumberland, W. Va., the cost of which it is stated will possibly aggregate upwards of $10,000. The drier capacity has been supplemented by eight additional tunnels which are constructed on lines in keeping with the other portion of the drier, being a hot air system of the management's own conception. The cars made necessary by the additional tunnels will be supplied by the Davis-Price Foundry Co. and 100 of these have been ordered. They will be made of cast-iron, with two decks. The Blackhorse plant is the largest paving brick works owned by the American company and it has a wide reputation for superior product.

A man was recently found dead in a kiln at the Standard Brick Works, Empire, O. It seems the kiln had only been off a very short time and was necessarily quite warm. The unfortunate appears to have wandered there while under the influence of liquor, and climbing up to the top laid down for a nap and as a natural consequence was overcome by the heat.

A steam shovel has been purchased by the Humphries brick works at Gratztown, Pa.

J. D. O'Brien, a former Pittsburger, has secured a contract to furnish a quantity of architectural terra cotta for decorating one of the buildings of King Edward VII in England. It is understood the ware will be shipped from this country.

The Myers Clay Manufacturing Co., of Toronto, O., in addition to its first purchase of almost 100 acres, has bought adjacent fireclay territory amounting to 215 acres. The last purchase was obtained for less money than is usually paid for such minerals in that section, the price paid being about sixty dollars an acre. This low figure may possibly be accounted for by the fact that the first purchase gave the Myers company the key to the situation—being the river and railroad frontage—leaving the 215 acres named without an outlet. It has been customary there for some years to pay $100 per acre for fireclay property without surface rights and as high as $200 an acre has been paid for such territory where it was considered unusually advantageous and desirable, but I only recall one instance wherein the latter figure was paid.

The rate of bricklayers' wages in Pittsburg has not as yet been fully determined for the coming season, but it is thought the contractors and bricklayers will soon come together on an advance for the men. Last year this class of artisans were at a premium and frequently five and ten cents an hour was paid in addition to the regular wage rate of $4.50 a day. I am informed by a leading workman that an advance of five cents an hour will be demanded and he expects the best mechanics will receive as high as 60 cents an hour when building operations get thoroughly under way. It looks as though the Pittsburg bricklayers would be able to keep the "wolf" away at least for another season.

The council at New Brighton, Pa., has passed an ordinance providing for an election to determine the question of issuing bonds to the amount of $150,000 for improvements. If the election results favorably, it is the purpose to spend quite a large sum out of the proceeds of the bond sale for street improvements.

A number of down-draft kilns have been built at the works of the Central Savage Brick Co., at Rockwood, Pa. This firm has secured a contract for 1,500,000 brick to be used in arching the Sand Patch tunnel on the Baltimore & Ohio R. R. near Cumberland, Md. Bricks for the same contract will also be shipped from the Humphries works at Gratztown, Pa.

The Stevenson Company, of Wellsville, O., has shipped four 9-ft. iron frame dry-pans to the Barberton (O.) works of the American Sewer Pipe Co. The Barberton plant has the reputation of being the largest sewer pipe works in the United States and is equipped with 60 down-draft kilns, other departments of the plant being in

proportion. Notwithstanding its enormous size and modern equipment, it is stated that other of the American Company's sewer pipe works make far better showing than this one.

Phillips & McLaren, of Pittsburg, have just completed and shipped a 12-ft. iron-frame wet-pan to a point in Canada. The pan, which is to be used in a cement works, is the largest machine of that character ever made by that firm.

It is understood that the plant of the Penn Brick Co., located at Leetsdale, Pa., may be abandoned owing to the growing scarcity of material and the expense connected with digging it. This material is a surface clay and the place from which it is taken is close to the Ohio river and a point beneath high-water mark. As a consequence every time the river overflows, the clay pit becomes filled with water and many hundreds of dollars are expended each time in pumping. As a result of the late flood, the clay pit is filled at the present time and it is said it may be allowed to remain that way. The Leetsdale plant has been in operation since 1882 and has turned out a fine quality of stock brick made on a Penfield soft-mud machine.

It is possible there never was a time in the history of brickmaking when workmen were as scarce at this season of the year as they are at the present time. Many plants are considerably handicapped on this account and are unable to run full time. Neither do I find this condition confined to Pittsburg and immediate vicinity, but it reaches out many miles in almost all directions from that center. One manufacturer was known to travel a distance of possibly 200 miles in search of men to operate his plant and was obliged to return with very little acomplished. This state of things applies alike to both brick and sewer pipe works.

There is talk of expending a large sum of money in Washington, Pa., this season in improving the sewerage system of the town.

Samuel and W. B. Goucher and Samuel McAdoo, prominent sewer pipe manufacturers of Toronto, O., in conjunction with other local residents, have made manifest their spirit of philanthropy by donating a pipe organ to the Methodist Protestant church of that town.

The capital stock of the Sankey Bros. brickmaking concern, of Pittsburg, has been increased to $200,000. This firm operates three plants in that city and makes a specialty of stock bricks made on Henry Martin soft-mud machines. The firm has always appeared quite prosperous and is said to have made quite a large sum of money out of the brick business.

Some Notes from Colfax, W. Va.

The Colfax Brick Co., of Colfax, W. Va., is busily engaged in repairing and enlarging its plant. A new hot-air drier is being erected and three kilns are being rebuilt. Natural gas will be used as fuel. The manager, Mr. Leitzell, has decided to make tile also as the clay is suitable.

The yard at Hammond is full of orders which it cannot fill, though it has been running full on builders.

The Barnes yard at Fairmount has recently increased its capacity about 75 per cent.

Boston and Worcester capitalists are interested in a project for erecting a steam brick plant at Thomaston, Me. The plant will comprise 10 kilns and will have an output of 100,000 brick per day.

Frank W. Cooley, formerly engaged in the manufacture of brick at Williamsburg, Ky., has removed to Lafollette, Tenn., where he will be superintendent of the brick department of La Follette Coal, Iron & Railway Co., of that place. The company has a plant of 30 M daily.

Death of Edwin Austin.

Edwin R. Austin was one of the best-known engineers in northwest Mexico, and we regret to have to report his death recently at 68 Morelos St., City of Mexico. The deceased was born at Melrose, Pa., where he has an extensive and prominent family connection . He left for Monterey in September, 1900, having been engaged previously in the clay business at Perth Amboy, N. J. In Mexico he took a position as superintendent and manager of

EDWIN R. AUSTIN.

the Compania Ladrillera "Union" and was on the ground superintending every detail of construction and installation of one of the most extensive plants in Mexico. This plant was carefully described in the August, 1901, issue of "Brick." He subsequently was actively identified with the Monterey Brick Manufacturing Co., and just previous to his demise had returned from a very successful trip through Texas in the interest of his company. His loss is mourned by a large circle of acquaintances among the first people of the American colony in Mexico. He leaves a wife and one daughter. The interment took place in El Carmen Cemetery. The loss is a severe blow to the Mexican clayworking community.

Obituary.

George Z. Zimmerman, aged 45, a brick manufacturer of Harrisburg, Pa., died March 23d of pneumonia, after a short illness.

Theodore W. Peterson, of San Jose, Cal., who owned seven large brickyards in the state, died at St. Luke's Hospital in San Francisco, March 10th, from heart disease.

Alfred Boole, a tile and brick manufacturer of East Orange, N. J., died of consumption, March 10th, after residing four months in Phoenix, Ariz., in the hope of recuperating his health. Mr. Boole was 52 years of age. He was well known among sportsmen as the owner of fine horses and valuable kennels.

Henry H. Schweer, who has been a prominent brick manufacturer of St. Louis, Mo., since 1843, died at his home in that city March 3d, aged 70 years. Mr. Schweer was one of St. Louis' first German citizens. For nearly 50 years he had been a member of St. Paul's German Evangelical church and was its honorary president at the time of his death. He was also interested in many charities. was a veteran of the civil war having played an important part in the defense of St. Louis in the days of the Rebellion, and was widely known in social and business circles.

Pyrometers.

The measurement of high temperatures is always an interesting subject and is especially important to the clayworker. The best efforts of scientists and instrument makers have been directed towards overcoming the natural difficulties incident to dealing with high temperatures and the result has been the development of numerous ingenious pyrometers, as the instruments for this purpose are called.

An interesting device is the "Queen" recording pyrometer, made by Queen & Co., of Philadelphia, for giving a continuous record of the kiln temperature. The recorder may be placed in the office, any distance from the kiln and connected to it by two wires. The pyrometer works on the same principle as Le Chatelier Pyrometer. The internal resistance is so high that the length or temperature of the leading wires do not affect its accuracy more than one-half of one per cent. The instrument consists of a very sensitive D'Arsonval galvanometer, the recording device and the thermo-element. The galvanometer and recorder are mounted together in one case, as shown in Fig. 1, so that the recorder makes an exact record of all the movements or variations of the galvanometer pointer. This is done without affecting the accuracy or retarding the sensibility of the galvanometer. The charts are graduated either in Fahrenheit or Centigrade scales up to 3,000 degrees F.

This instrument is believed to be the only one that serves as an absolute check on the fireman, and enables one to tell in the morning at what temperature the kilns were at any moment during the past twenty-four hours. It not only is a means of saving a good deal of fuel, but it enables one to turn out a much more uniform line of material and consequently a better quality.

Of equal importance to brick and clay manufacturers is another pyrometer made by Queen & Co. and called the "Queen" electrical pyrometer, which is essentially a very up-to-date form of Le Chatelier Pyrometer. It consists of a sensitive form of D'Arsonval galvanometeuter and a thermo-element. The galvanometer is portable and easy to operate. It is absolutely "dead beat," and so constructed that vibration does not affect the pointer, thus insuring a greater degree of accuracy than is obtained in other forms of Le Chatelier pyrometers. Owing to the special construction of the galvanometers they are guaranteed not to change their reading by constant use. The thermo-elements used with these two pyrometers are all tested and standardized.

The pyrometric telescope is another interesting device especially applicable to pottery and brick work. This is an instrument which

FIG. 1—QUEEN RECORDING PYROMETER.

FIG. 2—PORTABLE PYROMETER.

FIG. 4—MERCURIAL PYROMETER.

enables one to accurately measure the color of the kiln, or the intensity of the light, produced in direct proportion to temperature. It is impossible for any one to detect with the naked eye the slight changes in the color of the kilns from day to day. Every one knows how much brighter they look on a dark cloudy day than they do on a bright clear day. The Pyrometric telescope precludes such an error, as the eye does not have to be trained to detect the difference between all the shades of light from a dull incipient red to a dazzling white light, but only to detect one particular shade.

The pyrometric telescope consists of two Nicol prisms, between which is a quartz plate cut perpendicular to its axis. One of the prisms and the quartz plate are fastened in the telescope, while

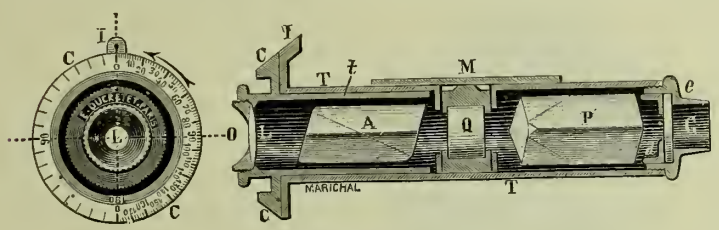


FIG. 3—TELESCOPE PYROMETER.

the other prism will revolve by turning the disk which is graduated in the degrees of arc. When the zero of this scale is opposite the fixed index, on looking through the telescope at an incandescent body it appears a bright green color, by turning it to a 90 degree angle the green changes to a bright red. It is the passage from the green to the red, a grayish citron or white light that is to be noted in taking a reading. The angle of rotation necessary to obtain this peculiar shade or sensitive tint, as it is called, varies with the intensity of the light examined. Each pyrometer is furnished with a table showing the temperatures corresponding to the different angles. The outside light cannot in any way affect the readings and the pyrometer will read the same at night as in the daytime.

Mercurial pyrometers are also useful to any brick manufacturer for measuring the temperature. These pyrometers are made in both angle and straight forms according to how they are to be used, and are essentially a mercurial thermometer graduated to 1,000 degrees Fahr., mounted in suitable metal cases.

Queen & Co. had a most interesting exhibit at the Cleveland convention of the N. B. M. A., where the various instruments here described were exhibited. The company's Pyrometer Catalog for 1902 contains much instructive reading.

National Association of Manufacturers.

The National Association of Manufacturers will hold its 7th annual convention in Indianapolis, Apr. 15-17, 1902. A committee of prominent Indianapolis business men under the leadership of D. M. Parry is making all local arrangements for the success of the convention. One of the interesting problems which will be presented at the convention will be the election of a new president. President Theodore C. Search has now served his sixth annual term as president and desires to relinquish his duties. During his presidency the membership of the association has increased from less than 200 to more than 1,000. The National Association of Manufacturers was organized in Cincinnati, 1895.

A new steam brick plant will be erected at Ellisville, Miss., this year.

Frank Kleffner, Jr., of Portsmouth, O., has decided to extend his operations in the manufacture of brick.

Pottery News.

A new kiln is being erected at the works of the Cambridge Art Pottery Co., at Cambridge, O. Up to the present time the company has been hampered considerably on account of not having the glost kiln capacity that it should have. The company is having a very nice run on its line of art ware at the present time and is disposing of the output just as fast as it comes from the kilns.

The Ohio pottery manufacturers are making strong protests against the passage of a bill by the state legislature whereby all incorporated companies are taxed 1-10 of 1 per cent on their capital stock. They claim that if the bill is enforced they will all withdraw their charters and run simply as partnerships.

John Wick, jr., president of the Ford China Co., at Ford City, Pa., and of the Wick China Co., of Kittaning, Pa., has sold his entire holdings in the latter to his brother, Fred. Wick, who will take charge of the affairs of the company. The consideration is said to be in the neighborhood of $40,000.

A scarcity of kilnmen at the plant of the Summit China Co., at Akron, O., has caused considerable inconvenience for some time but the company hopes to overcome this difficulty within a short time.

The United States Pottery Co., at Wellsville, O., is building four new down-draft kilns, and as these are first down-draft kilns in the Wellsville vicinity, the result is awaited with much interest.

The pottery decorating plant of the John D. Boyd Co. at Trenton, N. J., which was burned to the ground recently, has been rebuilt, and is now one of the largest and best decorating plants in Trenton.

A new pottery is proposed for Sioux City, Ia.; just who the parties are who intend to build it could not be learned, but it is known that E. Hartwell, of Fort Dodge, is interested.

The firm of Weil & Weil, of New York City, is suing the Union Potteries Co., of Pittsburg, for $3,500 lawyers' fees claimed to be due for assistance in the organization of their company some months ago.

The Dresden China Co. has been incorporated at Columbus, O., to do business at Salineville, O, with a capital stock of $200,000. The company will erect a plant and begin operations at once. The incorporators are W. H. Diedrick, H. G. Diedrick, H. H. Kirk, W. B. Hill and J. H. Dodd.

It is said that a new pottery will shortly be erected at Catlettsburg, Ky. Stockholders of the K. B. Cecil Pottery Co. of that city and of the Burley & Winter Pottery Co., of Crooksville, O., are interested.

The plant of the Vance Faience Co., at Tiltonville, O., was idle for about a week recently owing to extensive repairs which were being made at the works but which are now completed.

The plant of the Chelsea China Co., at New Cumberland, W. Va., was also idle for about a week owing to the extremely high water which recently prevailed in the Ohio River.

East Liverpool, O., was recently visited by a flood which entered a great many of her potteries, flooding them badly and threatening to do a great deal of damage. This was, however, prevented by timely moving of ware, machinery, etc., although the inconvenience was great and caused a shut-down of almost a week and untold hours of lost sleep by the "boss-potters."

Millville, N. J., is to have a new pottery. The style of the new concern is to be the Menke Pottery Co. The plant will be erected on a plot of twelve acres and will employ in the neighborhood of three hundred people. The output of the company will be confined, for the most part, to that of a varied line of jugs.

The immense art pottery of the J. B. Owens Pottery Co. was burned to the ground on March 2d, causing a loss of about $250,000, on which there was an insurance of about $143,000. The

Zanesville agent of several insurance companies had been negotiating for the increasing of the insurance to $175,000, and while it had been arranged for, it was not yet placed and the company, as a consequence, will only receive about $143,000. The fire originated in the engine room and spread all over the factory with great rapidity, and owing to a severe lack of water pressure, the fire department was the next thing to powerless, and none of the immense plant was saved. Hardly a wall is left standing. A small lot of ware and most of the office furniture was saved, but is hardly worth considering. The plant will be rebuilt at once.

The New Castle Pottery Co., of New Castle, Pa., is putting in some new machinery. The Universal Sanitary Manufacturing Co., of the same place, is also making some additions in the way of new machines.

A new potteries company has been organized at Evansville, Ind., under the name of the Crown Potteries Co., with a capital stock of $400,000, which will later be increased to $700,000. The company will take charge of the Peoria Pottery Co., at Peoria, Ill., and the Crown Pottery Co. at Evansville, Ind. The deal has been on for some time and as mentioned last month, Mr. A. M. Weil is at the head of the movement. The following officers of the new company have been elected: A. M. Weil, president; J. B. Cockrum, vice-president; Arthur Davidson, secretary; M. B. Wilson, treasurer; H. W. Flentke, general manager.

F. H. Cowden & Son of Harrisburg, Pa., are putting in some new throwing wheels in their stoneware pottery located in that city.

The new pottery being built at Barberton, O., is well under roof and is now nearing completion. The pottery enjoys the distinction of being the only positively fireproof pottery in the United States, perhaps in the world. There is room for conjecture as to whether this is a very great advantage or not, for if the entire plant is built of fireproofing it would lead one to believe that there would be some trouble in warming the clay-shops sufficiently for satisfactory drying purposes.

H. E. Bicknell, who until the first of this year was interested in the American Queenware Co., has purchased the Arsenal Pottery at Trenton, N. J., and the plant will be put into operation at an early date. Mr. Bell is interested in company with other Trenton parties in the venture. The plant is a five kiln one.

The offices of the Geijsbeek Pottery Co. have been removed from Golden, Col., to 1420 Fillmore St., Denver, Col.

The Bradshaw China Co., at Niles, O., suffered a shut down of an entire week last week owing to lack of coal.

Extensive repairs are being made on the kilns of the Delaware Pottery at Trenton, N. J.

Work at World's Fair, St. Louis.

The work of preparation on the grounds of the St. Louis fair is being pushed as rapidly as the weather will permit. One of the interesting features of this work is that of a novel idea in the transplantation of trees. The World's Fair which will be held in Forest Park, demands naturally a considerable amount of space for building. Much of this space is occupied by large trees which require removal. In order to preserve the trees and retain the advantages of their shade and beauty during the exposition they are to be transplanted and used as a lining to the broad avenues which will remain in the park as permanent reminiscences of the exposition. Many of these trees are from 12 to 18 in. in diameter and the undertaking, therefore, is fraught with considerable difficulty. The trees will be lifted from their present position while the life of the tree is still dormant and the coldness of the ground will enable the earth in which the roots are contained to be removed bodily without detriment to them. This experiment is a very interesting one and it is to be hoped that it will prove an entire success and these valuable trees will be preserved by this method. Should success be attained it will be a matter of ease for the householder to obtain in the winter time trees from any distance and of any size to be placed in his garden or grounds, trees in many instances which by ordinary methods would take 20 years to attain any considerable size of shading capacity.

Charles Burridge.

One of the leading ambassadors of trade in the brick machinery world is Charles Burridge, a representative of H. Brewer & Co., Tecumseh, Mich. It would be very difficult to forget him when once you had seen him. His tall form stands like a light house among his fellow men and a few minutes' conversation upon business or any other topics leave an indelible impress on the mind that the speaker is thoroughly conversant with all the ramifications of the subject with which he is dealing.

CHARLES BURRIDGE.

Mr. Burridge was born in Tecumseh and spent those happy days of childhood which we are all taught to regret, wisely or unwisely, pottering about in his spare hours at Brewer's machine shop. Here it was that he received his first mechanical instruction, so that it might be said that Mr. Burridge was brought up in the "Brewer" shops. As manhood approached, however, his feet deviated from the straight and narrow path of selling clayworking machinery and he wandered into side tracks of mechanical and electrical engineering. This proved a profitable undertaking, however, and it was not until four years ago that Mr. Burridge returned to Tecumseh, shortly after the death of Albert Brewer, and entered again in the employ of H. Brewer & Co., acquiring an interest in the business. Mr. Burridge has charge of the sales and advertising department and has proved a most valuable acquisition to the company. He brings to his work an all-round knowledge which is just the very thing that the brick machinery business requires. His varied experiences have supplied him with some very necessary ingredients of that famous dish called success—a little mechanical designing, some mechanical engineering, a knowledge of draughting—a faculty for conducting successful correspondence—a general grasp of the relations of the various parts of the business to each other and an intuitive discernment of the character of the persons with whom he comes in contact. Writing to us a short time ago Mr. Burridge used the following words in an extremely interesting and original letter: "I never set the world afire, never even put a match to it, but when I know of a man who wants to buy a brick machine I can make one corner of this great earth as hot as any one, and if the other fellow makes it hot I have the advantage of taking great pleasure in warm climates."

Mr. Burridge has been a regular attendant at the various conventions during the past four years and has made many friends during that time. The Brewer products have steadily grown into public favor and much of this success is without doubt due to the winning personality, business tact and hustle of the subject of this sketch.

H. A. Meyer, St. Louis, Mo., has purchased several acres of clay lands near Kemper Park, St. Louis, which he proposes to develop.

St. Louis Letter.

Business has commenced to be brisk with the clayworking industries and from now on, everything points to a very good spring trade. The brickyards, or at least most of them, have commenced operations. A few were delayed in beginning work because of delays in getting their plants in proper condition to begin. Those that have not commenced, will do so within the next few days.

Prices remain the same as last quoted, namely: Merchantable brick, $7.25; ordinary brick, $7.75; strictly hard, $8.25; red pressed brick, $17.50; and sidewalk and paving brick, $8.50.

Because there is no money in the city treasury to spare at this time, the construction of some of the sewers may be delayed until early in the summer. An effort is now being made to prevent the delay; and it may be successful.

The first World's Fair contract to be practically completed is that for the sewer system, which is to underlie the site. The Hanley-Casey company, which had the work in hand, a few days ago finished the brickwork of the system. The brick sewer which has just been completed is one of the improvements for the fair, which is to remain in the park after the exposition is over, becoming a part of the city sewer system. It was built under the supervision of a city sewer inspector, and is of lasting character. It was built 4 ft. in diameter, much larger than would have been needed for the exposition purposes.

The Fulton (Mo.) Fire Brick Co., with a capital of $60,000, all paid up, was incorporated a couple of weeks ago. The incorporators are David C. McCue, Luther U. Nichel and Mary E. Nichel.

The North Alton brick plant has resumed work with a full force of men, after a suspension of work while repairs were being made. The plant has undergone radical improvements and the output will be greater than before.

The St. Louis Clay Burning Co., with a paid-up capital of $150,000, has been incorporated by Dr. Young H. Bond, Charles G. Chadock, Carl Barck, Benjamin M. Hypes, Jos. R. Lemen, and Geo. C. Crandall.

The Hydraulic Press Brick Co. recently sold a triangle of railroad property of seven acres of land in the southwestern part of the city, for $75,000.

The Turner Building, on the south side of Eighth St., near Olive St., next to the Chemical Building, has been sold to the company owning the latter building, and is being torn down. It was built 20 years ago, but since then skyscrapers have been built around it, and the rooms in consequence became so dark that they became untenantable, so the owners thought best to sell while they had a chance. The Chemical Building Co. will erect a large building on the site as a portion of its own. The building was put up in the most substantial manner. The lower walls were three feet thick, of hard brick. At the fourth floor they were two feet thick, and the brick are as solid as the day they were set in mortar. The ordinary soft brick will crumble when a building is wrecked, but nearly all of those used in the Turner Building can be saved, and the material will be used again to build a hotel in the West End.

The Joplin Vitrified Brick Manufacturing Co., of Joplin, Mo., has been incorporated with a capital of $30,000, all paid up. The incorporators include T. W. Cunningham, F. O. Bartlett and Gilbert Barber.

The Illinois Brick & Tile Co., of South Litchfield, Ill., to manufacture brick, tile and clay products, has been incorporated, with a capital stock of $20,000. The incorporators are David Davis, Blanche K. Davis and Regina Davis.

The building permits issued in February shows a decrease below the corresponding month last year of $15,133. The value of brick buildings for February, 1902, is $446,506, as compared with $592,407; the value of frame buildings, $34,030, as compared with $10,982, and the value of additions and alterations, $190,975, as compared with $83,255. The totals are: February, 1902, $671,511; February, 1901, $686,644.

By the death of Henry H. Schweer, which occurred recently, St. Louis loses a citizen who has seen the most of the city's growth. He came to St. Louis in 1848, and shortly thereafter engaged in the brick business, in which business he was engaged up to the time of his death. He was one of the oldest brickmakers in the country. During the war he was active in the defence of the city. In 1891 he was severely stricken with paralysis; but he did not succumb to a subsequent attack, his death being due to a case of bronchitis of two weeks' standing.

At a recent meeting of the stockholders of the Fernholtz Brick Machinery Co., held this week, it was decided to change the name of the corporation to the Scott Manufacturing Co. The headquarters of the company are at 1214-1216 Poplar St. Secretary Rodgers reports that the business this fiscal year was greater than that of the two preceding years combined.

The St. Louis smoke inspector is considering whether the smoke from the seven brick kilns of the Hydraulic Pressed Brick Company, in the neighborhood of Manchester Ave., near the World's Fair grounds, can be abated. The smoke law exempts those who can show that smoke cannot be abated, and the brick manufacturers claim that with their peculiar furnaces there is no way of getting rid of the obnoxious fumes.

Preparations are being made to start a clay manufacturing plant at Bond Station, on the St. Louis, Kansas City & Colorado railroad, which, it is said will cost $125,000. A tract of thirty acres of land on the Dorset road, near the Colorado tracts, has been purchased by representatives of the St. Louis Clay Burning Co., which was incorporated a few days ago, as mentioned in another part of this letter, for the use of the plant, the deed for which was filed for record a few days ago. Dr. Young H. Bond was the seller and the price named in the transfer was $60,000, or $2,000 per acre. George Kingsland, who filed the papers, stated that work on the new plant would begin about August 1. It would manufacture vitrified, red and other kinds of brick for which the clay in that section of the county is said to be especially adapted. Other articles made of clay will also be made. The proposed new plant is only half a mile distant and east of the St. Louis vitrified brick plant, which was completed less than a year ago. Dr. Bond was said to have been interested in the older concern.

New York Letter.

The severe weather and the lack of coal have been great handicaps to the trade and have resulted in the closing up of most of the plants all winter. Preparations are being made to start operations and it is expected that by April 1st everything will be in full swing. It is believed that there will be a big demand this season and the trouble will be in making brick enough to supply orders.

The National Web Tile Sewer Co. at Warners, has several contracts to fill and will be started up at once. The outlook is excellent.

William K. Squier, manager of the Paragon Plaster Co., is enthusiastic at the prospects. The Paragon Co. is the sole agents in the territory from Buffalo to Albany for the Atlantic Terra Cotta Co., of New York City. The Paragon company is also agent for the Columbus Brick & Terra Cotta Co., and the Columbus Face Brick Co.

Robert Ballard, formerly with the Syracuse Press Brick Co., has started a brick plant a few miles west of Syracuse on the Erie canal. The Syracuse Press Brick Co. will not be able to run any

longer on account of the fact that the clay in the southern part of the city is about exhausted. Mr. Ballard will make common brick.

The Syracuse Stoneware Co., of Syracuse, is wholesale agent for the Akron Crown Fire Clay Co., maker of fire brick and sewer pipe, flue linings, etc., and also for the Robinson-Merrill Pottery Co., of Akron, O. The men now on the road all send in glowing reports. The trouble during the winter has not been in selling goods, but in getting them to sell, the railroads have been blocked up and there has been a scarcity of cars.

It is rumored that the Kirkville Press Brick Co. will start up again this season.

The New York Brick & Paving Co. is building some new kilns. The plant has been shut down all winter, but will be running in a short time.

George W. Pack & Son will be making common brick about the first of April. Mr. Pack has recently put in the new iron steam power machine "Quaker," made by James W. Hensley, of Indianapolis.

At a mass meeting held at the Chamber of Commerce to discuss the question of canal improvement in New York, one of the speakers made the following statement concerning its effect on the brick industry: "As an example of the use of the canal by a single industry of Syracuse, I would call your attention to a statement made to me since my arrival here by a firm making paving bricks. During the past season this firm has shipped 66 boat loads of paving brick and some of them went direct by water to New Haven, Conn. In making their brick they use two boat loads of clay daily and a boat load of coal from Rochester every other day. Asked what would happen if this industry were forced to ship its entire output by rail, the manager replied that they would simply go out of business. This is only a sample of the way the canals are keeping up the industries of the state."

H. O. Dorman will install a brick plant at Corning, N. Y.

The Onondaga Pottery Company had the order from the Townsend-Downey Ship Co. to make the plates which were used in the banquet to Prince Henry on board the yacht Meteor. They were souvenir plates, one being give to each of the guests. The decoration included the American and German coats of arms and a picture of the yacht and were designed by Thomas Bryan, chief designer at the pottery.

It is expected that the plant of the Empire Portland Cement Co. outfit of machinery, and the National Tile Roofing Co., of Lima, at Warners will be rebuilt.

John J. Moroney.

One of the most difficult men to corner for a biography of himself is the subject of the present sketch. J. J. Moroney is probably one of the best known representatives of brick machine manufacturing companies in the United States, and no convention or meeting would be complete without the sight of his portly form and genial countenance. Mr. Moroney possesses one title by which he is almost as extensively known as by his own name and that is the "King of Ireland" and though this would give him a right to be proud of his royal descent, yet he does not show it in his manner but is willing to "hoch" a hock with anybody and those who know him best confidently assert that they never were able to show a sufficient number of hocks to down John. His equilibrium is never disturbed.

J. J. Moroney was born in Chicago and commenced work with the United States Rocking Grate Bar Co., as an office boy and though now only 32 years of age, he is president and general manager of the company. He is, therefore, a symbolical reproduction of the story with which we are so familiar, "from log cabin to White House." His intimate knowledge of all the details of every business which he undertakes is shown by the many improvements which he has made from time to time in the products under his charge. The grate bar has been improved by him and in many lines of industry which use steam it is recognized as a standard fuel-saving device.

The "Lecture on Combustion" issued by this company will give the reader some idea of Mr. Moroney's jovial disposition and the way with which he mixes fun with business and we would not be surprised to hear that these grate bars had been adapted in extenso by his Satanic Majesty as hinted at in the lecture.

Mr. Moroney is also president of the Chicago Brick Machinery Co., which constitutes his main line of business, and his time is fully occupied in traveling to and fro over the surface of the earth with a little nickel model of the "Berg" press, like the gentleman in black in Job, "seeking whom he might devour" and equipping some

JOHN J. MORONEY.

of the largest pressed and paving brick plants in the country. His close application to the details of his business has placed him in the front ranks of experts on clays and clayworking, and Mr. Moroney is ever open to give advice of practical value.

Though he has passed the prophetic age of 30 Mr. Moroney's affections are, so far as we are aware, still disengaged and we are waiting the time when one of the many fair maidens with whom he comes in contact during his numerous and varied trips will entangle him in her mesh, and Moroney, the King of Ireland, will succumb to a greater than he.

No small measure of Mr. Moroney's success in his business, and there is no doubt whatever that he is eminently successful, is due to his taking manner, his uniformly genial disposition and also to his good memory for names, places and the details concerning the history of the plant which he has erected or which he has visited. It would have to be an extremely out-of-the-way place in the United States which John has not visited or in which he did not know somebody, or in which he did not know that somebody's aunt or uncle as the case might be. He is a veritable human directory of clayworking lore, and if it is a case of acquiring knowledge on most clayworking subjects we should undoubtedly refer the inquirer to J. J. Moroney.

The Jennings (La.) Brick Co. has decided to purchase additional machinery to be installed in its new plant.

The Queen City Brick & Tile Co., of Cumberland, Md., has just added to its plant a 9-ft. Stevenson dry pan. This machine was unloaded and placed in position ready to run in two days.

The Northwestern Brick Manufacturers' Association.

The Northwestern Brick Manufacturers' Association met in its third annual convention at Princeton, Minn., on March 4th. Princeton is one of the largest brick manufacturing towns in the state and therefore was eminently suitable for the holding of this convention. The brick manufacturers of the town entertained their visitors in a most generous manner and all left Princeton with a deep sense of gratification at their hospitable reception. Among those who attended this meeting were the following:

Charles A. Sprandel and O. Duclos, Little Falls; J. M. Moog, St. Cloud; C. H. Beumer, St. Augusta; August Lundgren, Warren; Louis Moline and Nels Flykt, of Wellmar; J. S. Bowers, of Minneapolis; M. S. Rusfeldt, Albert Lea; Henry Hess, St. Cloud; F. J. Nixon, Duluth; Philip Diesanz, Winona; E. M. Farnham, J. R. Farnham, H. H. Farnham, C. C. Farnham, W. H. Oakes, Charles Oakes, Milton Farnham, F. Reem, and R. P. Morgan, of Princeton.

Unfortunately the president of the association, W. P. Alsip of Grand Forks, was unavoidably detained by important business, but O. Duclos acted ably as chairman of the meeting which was held in the banquet hall of the Odd Fellows' block, Princeton. An address of welcome was made by J. R. Farnham of Princeton and the secretary, Louis Moline, of Willmar, then read his annual report which was adopted.

W. P. ALSIP,
Ex-President.

E. M. FARNHAM,
President.

LEWIS MOLINE,
Secretary.

C. A. SPRANDEL,
Vice-President.

We published the program in the last issue of "Brick," but owing to the absence of several of the members some of the papers were not given. However, those that were, were of the deepest interest to the convention and called forth much practical discussion, every paper being handled with enthusiasm.

E. M. Farnham spoke on "Transporting Clay from Bank to Machine."

W. H. Oakes bristled with points on "Burning Brick."

Mr. Hess, of St. Cloud, dwelt with the all-important topic of "Oil Fuel," and he was followed by Mr. Bowers of Minneapolis who has devoted considerable study and performed many experiments on this matter and his remarks were very interesting to the audience.

Mr. Hesss said that the wood supply at St. Cloud was getting scarce and that the time was approaching when some other field would have to be sought. He had noticed in September "Brick" for 1901 that a Chicago company were burning a kiln of 1,750,000 brick with oil for 53 cents per M. It now costs him $1.50 per M to burn with wood, and he had ascertained that oil could be procured for 4 cents per gallon f. o. b. at the yard. He reckoned that 65 gallons of oil would be equal to a cord of soft wood, this wood costing him $3 per cord by the time it was placed in the kiln. He intended soon to make a trial with oil and establish a comparison as to its economy with that he was now using.

S. M. Rusfeldt, of Albert Lea, handled the subject of "Coal Dust Burning" in a very able manner. He claimed that the admixture of hard coal screenings with the clay was a great assistance in the production of a hard and durable brick and lessens the time of burning considerably. He said that by the use of coal dust at his yard at Albert Lea he had saved in a season in the burning of 2,200,000 brick at least $500. The screenings were bought for about $1 per ton. He mixed the clay with the coal dust in the tempering pit of 20,000 brick capacity.

Among other remarks Mr. Rusfeldt said: "I only use coal dust in my Albert Lea plant, as I make a sand mold brick there. I cannot recommend it for a stiff mud brick, that is if I should want a nice smooth face on the brick, for although this coal is of no greater size than a grain of wheat, yet it will leave marks on the face of the brick where the coal has burned out. I make a wire-cut brick at my Wrenshall plant. The sand mold brick has a coat of sand and as there is no coal to burn out in the sand coat the sand covered up all the spots the coal leaves behind. I screen the coal with a plasterer's screen. I first saw coal dust used in Chicago in 1893 and never experimented with it until two years ago. My output at Wrenshall is 60,000 tile, and I intend to double that amount at an early date."

The matter of fuel for burning is becoming a very important one with brick manufacturers and the use of oil and such auxiliaries in the burning process as coal dust and screenings deserves the attention of every clayworker. A committee composed of Henry Hess of St. Cloud, H. H. Farnham and C. A. Sprandel was appointed to investigate on these lines and report at the next meeting.

F. J. Nixon, of Duluth, dealt with another interesting subject "The Grading of Brick," and in the discussion evoked by this the matter of shipping and other practical topics of a kindred nature were taken up and thoroughly threshed out.

The election of officers for the ensuing year resulted as follows: E. M. Farnham, president; C. A. Sprandel, vice-president; Louis Moline, secretary and treasurer. The association decided upon Minneapolis as its next meeting place, the date to be sometime in January. Committees were appointed to prepare the program and make the necessary hotel arrangements, etc. It was quite late in the evening when the association finished its labors and the members then proceeded straight to the banquet hall where they were entertained by the Princeton clayworkers.

Mayor Armitage and Judge Keith were the guests of honor.

The supper was served by no less a charming body than the Ladies' Aid Society of the Methodist Church and needless to say, everything progressed without the slightest hitch or interruption. Several musical selections were given and with J. R. Farnham as toastmaster short speeches were made by Mayor Armitage, Judge Keith, G. F. Wright, N. S. Jesmer and L. W. Pierson. A vote of thanks was tendered to the Princeton clayworkers and citizens for their hospitality and the visitors left for their homes on the next morning.

Among the members of note of the association may be mentioned O. Duclos of Little Falls, whose experience in the brickmaking business covers 42 years, and C. H. Beumer of St. Augusta, who has the honor of being the most "avoirdupoisic" member of the association. He is 6 ft. 4 in. in height, stands erect and has a large frame and broad shoulders. When introduced to the association everyone had to look up to the enterprising brickmaker of Stearns County.

The Federal Roofing Tile Co.

The growth of the roofing tile industry in the United States during the past decade has been phenomenal. It has opened up a new field of exploitation for machine manufacturers. It has given the architects new methods and style of house decorative effects and other roofing materials are looking askance at this infant industry and dangerous rival which has appeared with such suddenness and success to oust them from their former positions of prominence.

A new roofing tile company has just made its debut in St. Louis. The Federal Roofing Tile Co. has its location near St. Louis on the Burlington Railroad. The general manager is E. J. Hess, formerly with the Celadon Roofing Tile Co., of Chicago. Mr Hess has been known in clayworking circles as a man of practical experience and great ability for several years, and he has had the honor of being the youngest man elected as president of the Illinois State Clayworkers' Association, which position he held with credit and efficiency. His experience in the roofing tile business has been extensive, as he has filled positions both at the manufacturing and the sales end of the business. He has a wide knowledge of machinery, good mechanical ideas, a strong grasp upon the needs of the market and quite an extensive artistic range in designing practical and desirable patterns. We may add that from personal acquaintance we do not count as the least of his gifts a facility for making and keeping warm friends and acquaintances amongst those with whom he does business, and he already has a large circle of such among architects and contractors with whom he has done business for years. Associated with him in this new enterprise is W. Christy Hutchinson, who was formerly secretary and treasurer of the Standard Tile Co., St. Louis, Mo., who is also a young man of ability and wide acquaintance. The two together make a strong team for successful effort and we expect great things from this combination.

The plant has in addition to a good location a bed of very fine shale and fire clay. The shale burns hard and develops in the product a rich red natural color without any artificial treatment such as slipping or semi-glazing. This warmth of color without gloss has been much admired by artistic architects. The output will include interlocking patterns and flat shingle tile products by entirely new methods. A modern up-to-date plant is in process of erection. Six kilns have already been put up, to which are attached the Grath coking tables. The whole plant will be in operation about April 10th. A single tile machine is now in partial operation, while the presses for the manufacture of interlocking tile are being placed in position. Mr. Hess has received from architects and contractors, much encouragement and many compliments on the quality and color of the products, while a number of orders are already in hand, including Government jobs and orders for libraries, churches, school buildings and private residences. In view of the World's Fair at St. Louis there is no doubt but that the capacity of this new plant will be taxed to the utmost and Mr. Hess is making abundant preparations for this by securing the very best equipment possible so as to meet any extra demands on the plant's output. We have nothing but good wishes to express for the company and feel confident that the reputation that Mr. Hess has already acquired in business circles for energy, enthusiasm and honorable dealing will be sustained in this new enterprise.

Up-Hill Plant Erection.

J. W. Kane, of Chicago, recently returned from the south, having just finished the erection of the plant of the East Mobile Brick Co., at East Mobile, Ala.; this has a capacity of 30,000 daily. Two McKinzie machines are in operation, the brick being cut by a hand cutter. The clay is a yellow clay, burning red and making a good building brick. This company has secured the sewer contract for Havana, Cuba, and shipments will be made by barges containing 1,000,000 brick each, direct to Havana. The plant is conveniently situated for this purpose, the "arks," as the barges are called, being near at hand.

The construction of the plant was carried out under difficulties. The lumber had to be sawed from the forest for the erection of the plant and a good deal of labor was entailed in the blasting out of the roots with dynamite in preparing the ground for the site, and in driving the piles a large frame had to be erected and a heavy piece of oak was used as a pile driver. All the iron work was made on the spot and wood had to be burned to make the charcoal for the blacksmith shop so that it will be seen that Mr. Kane had to exercise considerable ingenuity in making the best use of the rough materials at hand. The town of Mobile is across the bay some 14 miles away. H. C. Holmes is the president of the East Mobile Brick Co., and J. W. Newman, secretary and treasurer.

The Owen Terra Cotta Works at Hobart, Ind., has been sold to a New York and Chicago syndicate for $100,000.

Smith & White, proprietors of the tile and brick works at Harvel, Ill., will soon begin rebuilding that part of their plant which was burned several weeks ago.

The Laclede Firebrick Co., St. Louis, Mo., is erecting a new office building on the Manchester road at a cost of $9,000. R. T. Dawson & Son are the architects.

A complete equipment of machinery has been installed at the new plant of the Renton (Wash.) Clay Works, and operations have been begun with orders on hand for 500,000 red pressed brick, to be delivered within 120 days.

The Crowley (La.) Brick Co. has sunk a well on its property at a depth of 154 ft. for the purpose of obtaining the fine white sand used in the manufacture of its product. At the first test the well spouted 15 car loads of sand in seven hours, an enormous air compressor being used in the process. It is believed the well will produce all the sand required for the home market with the result of a great reduction in operating expenses.

CORRESPONDENCE.

By reason of its large circulation "Brick" offers exceptional advantages for the exchange of information on practical subjects in which the clayworker is interested, and we urge our readers to avail themselves of the "Brick" correspondence columns, and lay their questions and troubles before their fellowworkers, some of whom are almost sure to know the best solutions for the problems. All answers which we can print will be paid for at our regular rates. Where the subject permits of it a sketch or drawing will often add greatly to the clearness of the answer.

BRICK BURNING AND SETTING.

Editor "Brick": Will you please answer the following questions as to how to set and burn 300,000 soft-mud bricks encased within a temporary wall so as to get the greatest proportion of hard brick?

1. How many bricks high and how many long (standard size) should they be set?
2. How far between arches?
3. How spaced in benches and arches?
4. How platted on top of kiln?
5. Shall I fire with open or partially open dampers and burn out middle of kiln first, then a head at a time by closing dampers on one side, or shall I burn as much of the kiln as I can at first by keeping dampers closed?
6. How fire so as to keep the ends from cracking off of the bench and arch brick?
7. What per cent should be good hard brick?

Lynchburg, O. S. M. Garner.

[There are very many methods of setting and burning brick, varying according to the specific ideas of the setter and burner and also, according to the quality and nature of the clay. The main thing to observe in setting a kiln is to study the draft and bricks are set only with this end. In setting the first arch the inside half of the arch should be set tight from the ground to the top overhanger so as to force the heat to the outside and the corner of the kiln. This method gives good, bright corners. In running up the heads, they should be set open. In setting the arches the third and sixth arches should be set tight in the bench and the third tight in the overhangers. If however, the clay is easily melted, the arch should not have more than two tight courses. This avoids the retention of too much heat in the arches. The brick should be set carefully so as to insure a regular draft, or else cold spots will occur. The arches should be about 18 in. wide and the panels not less than three bricks thick, and if easily fusible clay, they should be set not less than four bricks thick. The platting should be of good salmon brick, one course running the same way as the top course of the kiln with breaking joints. When the kiln is ready to fire every other brick and every other course is turned to insure a good draft to facilitate watersmoking. The breaking joints render it easy to close up the top of the kiln. When the watersmoking is all off, turn the bricks down before the kiln gets too hot to walk over.

In the burning the mouths of the arches should be kept about half full at the start, and this firing should only increase half at two hours when the heads will begin to be pretty well warmed. Coal should be fed in small quantities a little at a time, so as to maintain perfect combustion until the fires meet. After this the heat should be maintained so as to follow up the watersmoking closely so that the moment the watersmoking is finished the fire will be let to the top. It is then a good method to close up one side of the kiln and fire across, then close up the opposite side and fire back until perfect settling is effected and the brick is burned out close.

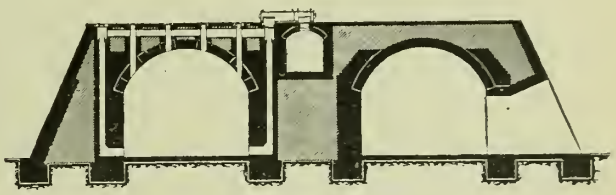
Great care should be taken not to fire when the arches are too hot, as the brick under the arches will mold. The firing should be regular, so as to get a good red brick. It is also for certain clays deemed advisable to mix coal dust with the clay, a few shovels full to a cart load, which is estimated to run the brick more evenly and to effect a saving of fuel. There are, however, many opinions as to this, and the use of coal dust with the clay must be determined by experiment only.

As regards your percentage of good, hard brick we visited a kiln a few days ago that had 95 per cent of hard brick and a percentage of this character depends greatly upon the burner and his method of handling the kiln. We will be pleased to advise you further should you require assistance.—Ed.]

"SCHEIDT CONTINUOUS KILN."

Editor "Brick": In "Brick" for December, 1901, I find on page 263, under the title "Scheidt Continuous Kiln," the description of an annular kiln with an upper vent for furnace gases. The accompanying illustration bears a striking resemblance to an illustration in my prospectus, page 5, Fig. 3, a copy of which I send you. (Reproduced herewith.)

I should not be surprised if this would-be inventor, Herr P. Scheidt, is the man who once lived under the same name in



BOCK CONTINUOUS KILN.

Maastricht, Holland, where he put forth extravagant advertisements of kilns.

He not only claimed these kilns as his own invention, although they were my kilns, but he even made use of my plates and reprinted word for word testimonials which had been given to me, merely changing the names and mentioning a firm which did not exist.

If you happen to have the "Thonindustrie-Zeitung" of 1889, you will find on page 713, under the title "Industrieritterthum" (Industrial Chivalry), an article in which the conduct of Civil Engineer Scheidt in Maastricht was fittingly exposed. The editor of the "Thonindustrie-Zietung" added the following comment: "Such audacity passes all bounds and deserves public censure. We suspect that this P. Scheidt is the same individual who formally lived in Dortmund. Since life was made uncomfortable for him in Dortmund he has presumably transferred the scene of his activities to Holland. We, too, have complaints to make of him."

Yours truly,

Berlin, Germany, Jan. 28, 1902. Otto Bock.

A MISSISSIPPI BRICK AND TILE PLANT, MONTEVALLO CLAY WORKS, GRENADA, MISS.

An Interesting Letter From a Progressive Southern Manufacturer.

Editor "Brick":

Thinking it might interest you to hear from this section of the country in connection with the subject of brick manufacture, I write to give you a few items. My plant is situated on a branch of the Illinois Central R. R. running west from here into the Yazoo Valley, and is just west of the corporate limits of the town. There are unlimited clay and wood resources, as a thousand acres are

available for wood and 55 acres immediately adjoining the town are devoted to the brick and tile plant. The grounds are ample and perfectly level where the machinery and kilns are located, offset in the rear by high hills from which the clay comes down grade to the plant—every movement of the clay carrying it nearer to the railroad side track, until the brick and tile stop, after removal from kilns, right at the cars and on a level with the tops of the cars, as the railroad passes through a low cut just at this point. This is a decided advantage, as most sales will be by shipment, especially into the Yazoo Valley and many a dollar will be saved by this convenience in the saving of labor.

As to clays, this section of Mississippi is overlaid by a yellow loam deposit from 6 to 10 ft. deep. This is an ideal brick clay, with just the perfect natural admixture of alumina and silica which makes the clay easy to handle, mold, dry and burn. Beneath this yellow loam, which is always just under the top or surface soil, lie the clays of the "orange sand" formation, which, though more tenacious than the yellow loam clays, are easy to work. Still further down are the very stiff tenacious clays of the lignitic or miocene tertiary formation, with here and there extensive beds of shale. These clays are well adapted to tile or other products, what mixed with the upper clays or sand. There are vast shale deposits underlying my ground. The Yalobusha river, a few hundred yards distant, flows over such a deposit, which at the bottom of the river is contorted, while above there is an extensive bluff of shale laid in horizontal layers. This shows that the deposits were formed at widely separated geological eras, and must be in consequence very deep. I think this shale will make a fine paving brick or a very hard refractory common building brick, and will test it and all other clays in the neighborhood (of which there are many varieties) as soon as possible.

Mississippi has no metallic ores or minerals of account, as she has no igneous deposits, but all her formations were laid down under oceanic waters, yet she is rich in a variety of fine soils and clays. My plant is very fortunately situated as to clays and as to facilities for marketing the manufactured product. I have two separate steam plants, one for the manufacture of common, soft-mud, sand-molded brick, the other for tile and stiff-mud, wire-cut brick. The clay is drawn up to crusher of machine into a second story on cars by wire cable and friction hoist, the cars running on steel rail track and being side dump. The track is excavated as deep as top of cars at the farther end, where the cars are loaded. A part of the track is bridged over, so that at odd times a large surplus of clay can be collected and when wanted let down into cars by removing short pieces of plank. This is a great convenience and improves and mixes the clay. My dry house is 30x120 ft., two stories, and will later on have a hot floor, utilizing the waste steam, so I can make brick in all weather. Still I am going to follow D. V. Purington's advice and use the southern sun and wind to do my main drying. But there is one cardinal principle, I will never vary from—that is, never allow a brick to go into a kiln unless it is bone dry through and through, however long it may take to dry it, or whatever theories drier sellers may put forth.

I have four structures up for kilns, which are 24 ft. square inside of walls. They are common up-draft kilns now—later on there will be a perfect square of 12 kilns, connected by underground flues and with the down-draft and continuous principles developed as far as possible, yet with the "old reliable" up-draft practice still to fall back on.

So, you see, I am favorably situated for a successful, up-to-date southern brick plant, and if I prove to be an "underling" in the business it will not be in my "stars," but in myself. I have received very great benefit from your journal, and later on may give you other items as I develop anything worth communicating.

Yours for progress, Oscar F. Bledsoe.

IN RE CONTINUOUS KILNS.

Editor "Brick": Having seen William Baillie's article on continuous kilns in "Brick" I wish to ask him some questions through your paper. We contemplate putting a plant here to make about 20 M common brick from common yellow clay. We wish to make a stiff-mud, side-cut brick and we know that a right start is half the battle. We think of putting in tunnel driers of the hot air type and have reports of the Dunn kiln at Ottumwa, Ia., that are very good, also of a modified Hoffman at Des Moines, Ia. About how many chambers should there be and how large? What is the cost of a kiln the size we need? How is it built, and how much ground does it cover?

Yours truly,

Marshalltown, Ia. Charles A. Buckwald.

"Editor "Brick":

The advantages of continuous kilns for common brick over all others are very great.

1. Two-thirds may be saved in cost of fuel, but this varies according to localities and conditions. 2. The brick are all hard which is much to be desired in all cases. 3. If the burner knows his business there is little or no waste in continuous kilns.

Mr. Buchwald wishes to know the cost of a kiln of the continuous type for 20 M per day. It is just as easy and as cheap to build a 25 or 35 M kiln as a 20 M; a 14-chamber kiln will do this, but I always advocate 16 chambers. Again, the cost of the kiln varies according to locality. The cost of a continuous kiln of 14 chambers will be from $8,000 to $10,000. Sometimes if the ground is favorable for a good foundation it will cost less than $8,000. These figures may look high, but the great saving in future in fuel and quality of brick very soon offsets all this. It will cost still more to build down-draft kilns for the same capacity and then the fuel consumption is greater.

Mr. Buchwald says he has a common yellow clay. There is a large variety of such clays, I have handled many of them. Some will in common clamp kilns, crack all to pieces in the arches and these same clays which will crack in the arches will come out all perfectly sound in either continuous or down draft kilns. Again, there is some yellow clay which will come out all sound in common up draft kilns.

It is first to know your clay and then you know what kiln is the best, but in all cases the continuous kiln for common brick is first and the best, and for face brick of the dry pressed system, the down draft is the best. In many instances the down draft is the best for pavers, although in continuous kilns pavers are good.

The ground required for a 14-chamber kiln is 153 ft. x 54 ft.

Yours truly, Wm. Baillie.

WHAT THEY SAY ABOUT BRICK.

I am very much pleased indeed with "Brick" and consider it far and away the best periodical for clayworkers published, and although only a new subscriber I have already received information from it worth several times the price of subscription.

Yours truly,

Brickville, La. George W. Deller.

We beg to hand you postal order for 6s. 2d. ($1.50) for subscription to "Brick" for the next year. We are much pleased with your paper and read it with very great interest.

Yours truly,

Hanley, England. E. Hampton & Sons.

Enclosed find $2.00 for two years' subscription to "Brick"—it is the best investment a brickmaker can make.

C. H. Beumer.

Enclosed find $1.00 for "Brick" to February, 1903. While I am now out of the brick business I still like "Brick".

J. M. Powell.

ANSWER TO M. T.

Editor "Brick": In answer to the inquiry of M. T. on page 157 of "Brick" for March, I believe he would get satisfactory results by burning his brick in a down-draft kiln, and still better by using 30 per cent of sand instead of 20 per cent.

Yours truly,

Spring Hill, N. S. S. A. Myatt.

Editor "Brick": It seems to me that there might be three reasons for M. T.'s trouble about poor brick just above the arch, as described on page 157 of your March issue. First, too much heat in drying; second, not heating up promptly or fast enough; third, the brick may be set too loose. A single tight course over the closing jet, if he does not already use it, might be of some benefit. Sand tends to make the brick brittle and poor and requires more heat and less drying in burning, and costs more in fuel; if the rest of the kiln is satisfactory I would not advise more sand.

"Also New Jersey."

THE N. B. M. A. RATTLER TEST.

Maryland Geological Survey,
Highway Division,
Johns Hopkins University, Baltimore, Md.

Editor "Brick": I read with much interest the article of Daniel B. Luten in February "Brick", page 69, criticising the N. B. M. A. standard rattler test. In our laboratory here we test all the paving brick for the city of Baltimore and I had noticed the point brought out by Mr. Luten, the variability in the individual bricks composing a charge for the rattler test, and my experience leads me to agree with his conclusions.

I would inquire as to the method used to mark the bricks so that they can be identified after the test, and the individual losses determined.

Your readers may be interested in my experience with chilled steel shot in making rattler tests. I put in one or two such shot and found they suffered no appreciable loss after 200,000 revolutions. It seems to me that no difference in results could be caused by the use of such shot, provided they were of the proper shape. And if chilled steel shot were used the saving would be considerable.

Yours truly,

A. N. Johnson,
Highway Engineer.

Editor "Brick": A very satisfactory method of marking the brick so as to determine the individual losses is to drill holes in the side of each brick with a small flat steel drill, say one-eighth to one-quarter inch diameter. In case ready access cannot be had to a power drill, marking with a cold chisel is a very simple and easy method, but the brick will have to be examined at frequent intervals during the test, say evey ten or fifteen minutes, and perhaps re-marked as the original marks wear away. As it is almost essential for a satisfactory understanding of the test, that the losses should be determined at frequent intervals, this re-marking does not add materially to the complexity of the test.

It would seem as though chilled steel brick instead of cast-iron would be highly desirable, and the suggestion is a very good one, provided the cost would not place the test beyond the reach of engineers who make but a few tests in the year. If the use of chilled steel would produce the same results as cast-iron, then its use would be purely a matter of individual preference; otherwise the relations of the two materials would have to be determined by an investigation into their relative merits.

Yours truly,

Daniel B. Luten.

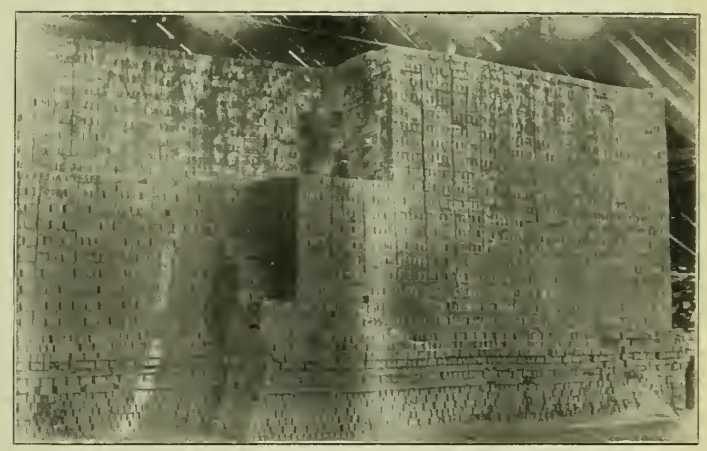
THE VOICE OF THE POTTER.

Editor "Brick": Enclosed you have $1.00, being my subscription to "Brick". Permit me to say that I have been in the pottery business for over forty years, and I consider that the one number of your journal to hand is worth more to any clayworker than ten times the cost of subscription. Wishing you every success, I am,

St. Johns, P. Q. W. A. Campbell.

BURNING WITH COAL DUST.

Editor "Brick": In your report of the meeting of the Clayworkers' Association of Wisconsin, Mr. Hinkley is reported as introducing the subject of coal dust in brick. Mr. Sanborn, in replying, made two mistakes in his method of using coal dust, first, in pouring it around the heads in place of making the brick for the heads very much stronger with coal dust at the machine. Secondly, he made the mistake of drying off too hot. I warned brickmakers against this in my former communication. The coal dust should not be allowed to catch fire until it is time to bring the kiln to a hard brick heat.



A WELL-BURNED KILN.

As Mr. Randall truly says they use coal dust along the Hudson river, but every brick in the kiln has the same amount of coal dust irrespective of position in kiln, except the outside and top course under platen, which have about three times as much. The first are called "single coal," not "coalers," the second double coal. In 1900 there were made 1,100 million brick that were available to the New York market. As you can infer the competition is and always has been very keen. The building law and the market demand a uniform hard brick; the clay in one locality differs from the clay in another, and yet they all use coal dust.

No brickmaker could possibly compete in this market without the use of coal dust. Anthracite dust is used and the price varies from $1.50 to $1.65 per ton. As the mode of burning is so entirely different with coal dust and without, it would no doubt be advisable to get a man to burn who understands its use, or visit a yard where it is used successfully and the points there gained to be used with common sense to suit one's surroundings.

The accompanying illustration shows a kiln of brick benches of four 51 high and 50 wide, burnt with wood. The bricks were made with nearly one bushel of coal dust to every thousand brick, and they are all hard-burnt brick. The amount of coal used was about 5½ cords to the arch of 44,000.

Emgee.

DRYING BRICK.

Editor "Brick": I would like to have some of your readers, who are drying brick in steam driers using exhaust steam during the day and live steam at night tell me what success they have had and the cost of such a drier with a capacity of 25 M. per day. If they have a preference for any one drier I would greatly appreciate an answer through the mail. Yours truly,

Oakland, Neb. A. Anderson.

IN REPLY TO TOUGH CLAY.

Editor "Brick": In reply to the inquiry signed "Tough Clay" in "Brick" for January, 1902, page 10, I will say that I use a wet pan for very tough clay. The wet pan for very tough clay has the grating in one segment of the pan only and the pug mill should be set immediately below this grating. I have two sets of rolls above the pug mill; the lower rolls have ground faces and can be set close together so as to make the clay very fine. Our pan is fitted with a water pipe so we can temper the clay to any desired degree of softness, for brick or drain tile.

Tough Clay would find it a great advantage to cast his clay early in the autumn and let it weather well during the winter. This will help very much to reduce the small lumps, and make a good perfor- tougher and more plastic. This class of clay makes a good perforated brick with about three rows of ½-in. holes—six holes to a row. Such bricks are lighter, burn a better color, and are more easily dried than when solid.

Carlisle, England. J. Beaty.

AN EXPLOSION DELAYS A BRICK SUBSCRIPTION.

Editor "Brick": Enclosed find a big dollar bill for our renewal of "Brick." Please overlook the delay, for on March 5th some of our miners and brickmakers were burned by the eplosion of a keg of blasting powder. Two visitors to the grounds were also burned severely in the face and hands. Fortunately their sight was uninjured. We anticipate that the workers' physical condition will be normal some time in April, ready for commencement of operations in our yard. The worst blow of all was the injury of L. C. Wells, who is learning the brick business here and was just married two weeks previously. The business prospects for 1902 are exceedingly good.

Yours very truly,

New Salem, N. Dak. Bowser Bros.

It is reported that Fremont, Hanson and Isaac and E. Harness have opened negotiations for the purchase of the Lexington (Ky.) Brick & Tile Co's. property. A number of additions and improvements of the plant are contemplated by the prospective owners.

The Latest Result of Cling-Surface.

A slack running vertical belt is not a common occurrence, hence the one shown herewith will be of interest. It is in a large machinery plant in Philadelphia and has been treated with "Cling-Surface." Before such treatment the belt ran under the strain of the iron idler shown and was as tight as the latter could make it. "Cling-Surface" stopped any slipping of the belt which permitted it to be run, as shown, and rendering the idler needless. The belt is 14 in. face, 10 ft. centers, from 64 in. driving pulley to 42 in. driven pulley; the speed of the former 86 2-3 r. p. m. The driven

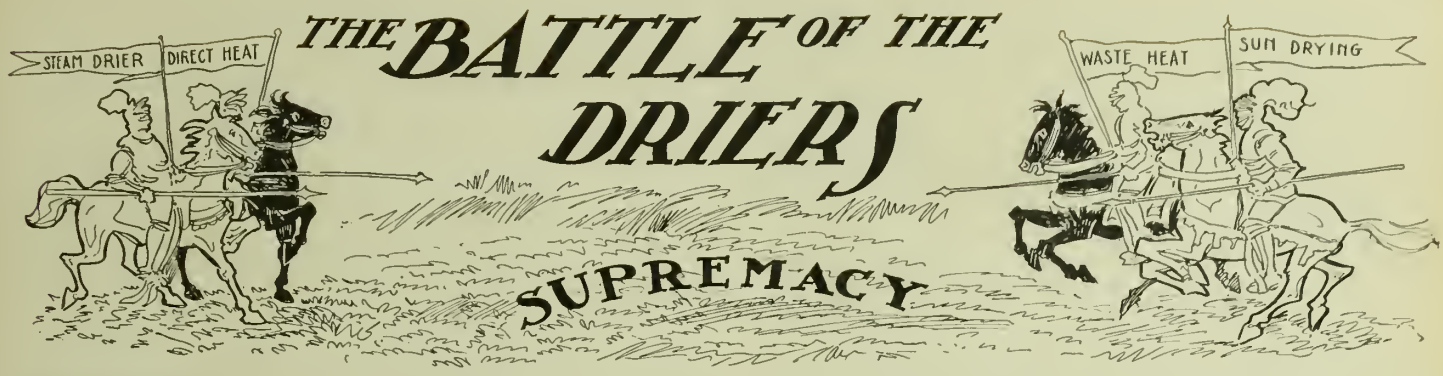
counter drives another counter to the left and from it a dynamo, and the belt was transmitting 55 h. p. with ease when the photograph was taken, and not a particle of slipping.

The Cling-Surface Co. does not claim that such results are always possible after using its preparation, although this is the second instance of this kind that has been reported to it, the first being in the Norwalk Iron Works, South Norwalk, Conn., and there are many others where less slack occurs. The company does claim, however, that it proves the perfect cure of slipping resulting from "Cling-Surface," and the possibilities which intelligent use of the material permits. The economy of this method of transmission over the former is self-evident.

The output from the Salina, Kan., brickyard last year was 3,500,000 brick of which number 2,500,000 were repressed.

L. U. Nickell, manager of the two fire brick plants at Fulton, Mo., is organizing a new company to operate a firebrick works in Fulton as successor to the present company.

F. W. Aldrich, of Painesville, is supervising the erection of the Blackburn Face-brick & Tile Co's. new plant near Leavittsburg, O., which is nearly ready to be put in operation The plant will have a capacity of 20,000 face-brick and 50,000 building brick per day, in addition to a large capacity for tile. Eight down-draft kilns have been built, and a brick drier 50 x 175 ft.; a frame machine room 40 x 90 ft., and an engine room 32 x 40 ft. are being built.



Drying Brick with Waste Heat from Cooling Kilns.

BY J. W. SIBLEY.

Our experience in this matter having extended over a period of less than a year, may make it seem presumptuous in our attempting to throw much light on the subject. For ten years we had been using a steam drier, combining both blower and floor pipe systems, and for a capacity of 25,000 daily were working the life out of two 100-h. p. boilers, as we used only live steam for drying and our fuel consumption at boilers was ten to twelve tons every 24 hours.

Fortunately for us, we owned our coal mine and were able to get the fuel at less than $1.00 per ton.

Desiring to increase our drying capacity to 35,000 daily, we decided to put in the waste heat system, of which we had heard so much in the last conventions. As our kilns were already built and our plant located in a valley, we found it impractical to use underground tunnels, on account of dampness when going below the level of our kiln flues, as would have been necessary. So we adopted the overhead pipe system, as used by Mr. Purington at Galesburg, the fan and engine being located at the discharge end of the drier and about midway of the line of kilns, there being an iron damper at each kiln and cool air inlet to regulate the temperature of the air as delivered to the drier.

The heat is delivered in a large conduit across the discharge end of the drier, gradually decreasing in depth, so as to distribute the heat as equally as possible in the small flues that branch off at right angles and extend up the center of each track, there being two tracks to each tunnel. Over the tops of these flues we placed sheet iron, cutting small openings under each car, these openings decreasing in size as they progressed toward the receiving end of the drier, thus supplying the hottest air at the discharge end. We place two high register thermometers in tunnels Nos. 1 and 6, so as to regulate the temperature of the drier, fixing the dead line at 300 deg., though it is said to require 600 deg. to ignite wood. To avoid the possibility of having to shut down for lack of a cooling kiln, we have a small kiln near the fan, which we fire up when needed and draw the direct heat into the drier. This will occur perhaps two or three days in a month.

Through a mistaken idea of economizing by utilizing our old drier building, which was largely constructed of wood, and firing the small reserve kiln with coal, instead of coke, as we now do, I was called up over the long distance 'phone about 2 a. m. on September 18th and advised by the superintendent that all we had left at one plant was the kilns and the hot air blower, the latter, though causing the fire, remaining untouched, as if through the irony of fate. Fortunately, we had a good amount of insurance, which before the fire seemed an expensive luxury at a $3.60 rate. The loss was promptly adjusted, the insurance men, no doubt, having heard of your treasurer's propensity for maintaining a surplus at all hazzards.

As fast as material and labor could do so, the plant was rebuilt and in operation early in the new year. In rebuilding, especially the drier, we spared no cost to make same fireproof. The walls are of brick and the roof of T iron, upon which is a course of hollow fireproof tile, and upon that a course of vitrified brick, laid on flat in Portland cement, and the whole grouted over with cement, thus giving us a waterproof roof and avoiding the necessity of an extra shed. The doors are covered with tin and the cross ties are iron, leaving nothing to burn but the brick.

I will mention, casually, that as a result of this style of construction the insurance company that had paid us the loss on the old plant gladly accepted the new risk at $1.75, preferring same to the old plant at $3.60. We have no trouble in drying 35,000 brick with heat from the cooling kilns daily, and have been enabled to relieve one of our boilers entirely from duty at night, and before the fire had reduced the fuel bill at boilers from 10 and 12 tons to 5 and 6 tons for 24 hours.

In the improved arrangement of boilers at our new plant and utilizing of exhaust steam for heating water, which is fed into our boilers automatically, without the use of injectors, our fuel bill has been reduced from 3½ to 4 tons for 24 hours. So much from the standpoint of economy in waste heat system of drying. We find that our brick are more uniformly dry than under the steam system, where frequently the centers were wet, and our superintendent says his life has been lengthened ten years by relief from worry over keeping up a thousand or more joints so prone to become leaky.

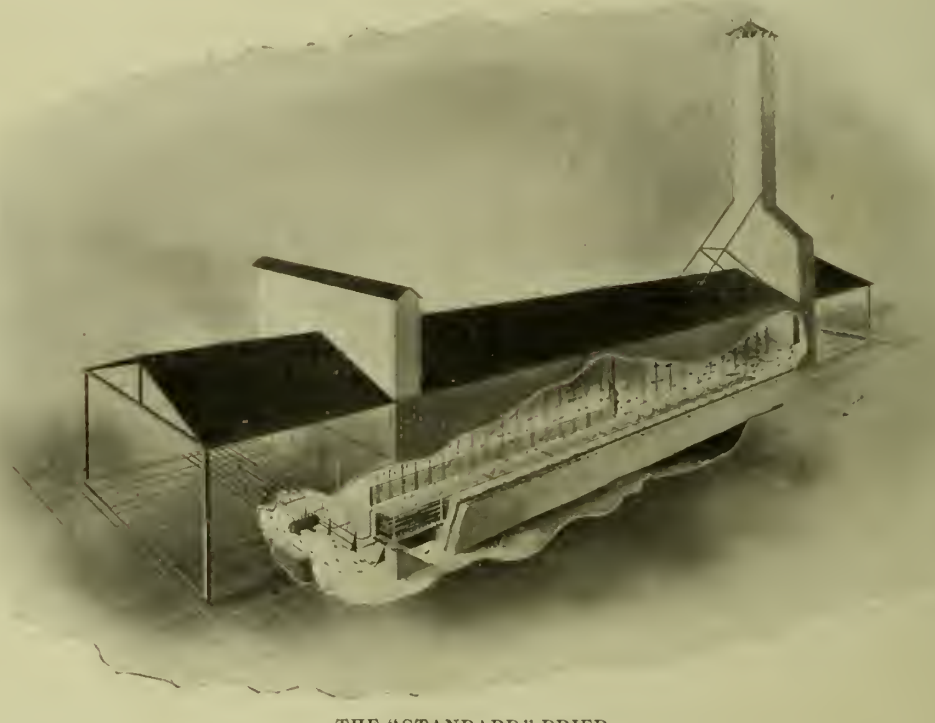
We were fearful that the taking of the heat from the top of kilns would have a tendency to check the brick, which, of course, was not desirable when the product was paving brick, but we have never been able to discover any trouble of that sort, the dampers all having been put in when kiln was closed down and all openings stopped and plastered. The space between the top of brick and crown of kiln, seeming to contain such an immense number of heat units that what we draw out in the fan does not affect it seriously, though we cool our kilns from 24 to 36 hours quicker than before, which, of course, increases our monthly capacity considerably. In the old plant we utilized the tall wooden stacks to carry off the vapor, thus removing same by the up-draft system. In the new we built two brick stacks and remove vapor by the down-draft system. We found that the tops of the tunnels, near the receiving end, were covered with a dew and the cars from the machine was received into a more humid atmosphere than formerly. This, we presume, would be advantageous to any one who had a shale or clay that had to be handled tenderly in drying, but as our shale can be dried very rapidly, the brick that were in the drier at time of the fire not having been checked by that intense heat, we found it objectionable to have this surfeit of moisture. To obviate it we experimented by leaving the doors slightly open at the end

*Read before the N. B. M. A. Convention, Feb. 12-16, 1902, at Cleveland, O.

of drier during the night, and found next morning that the dew had vanished, and we got 25 per cent more dry brick. We are of the opinion the same results can be obtained under our down-draft system by building our vapor stacks higher, to give greater draft, or by using a small fan to exhaust the vapor from the drier. As I said in the outset, I would not presume to say that, from our limited experience, a waste-heat drier is best for every one, but I firmly believe that it is the most economical to the paving brick manufacturer, especially to those who have to buy coal on the market and pay freight on same.

The Standard Drier.

The Standard Dry Kiln Co., of Indianapolis, Ind., claims for its "Standard" steam drier a much wider field than other types of driers, being adapted for use with more different kinds of clays and under more different conditions as to capacity of the yards, etc.



THE "STANDARD" DRIER.

A short description of this drier will undoubtedly be of interest to manufacturers of clay products. The building is made entirely of frame or brick construction, but preferably the latter, and is ordinarily 116 ft. long; the tracks are laid on a slight incline through the drier tunnels, facilitating the motion of the loaded cars, and extend usually 10 ft. on the receiving end platform and 25 ft. at discharging end. Each track holds 16 cars within the tunnel, each of 432 to 625 brick capacity, dependent upon the style of car and kind of brick.

The method of drying is described as a combination of heat and moisture in the air, by which the surface pores are kept open and the moisture drawn from the center of the green product; it is a gradual yet speedy process and dries the brick thoroughly inside and out and renders checking or cracking almost an impossibility.

The air is admitted into the drier through the slatted floor of the discharging platform, and is heated by direct contact with the large radiating surface of what is termed the primary heater—a series of steam radiator coils located in a pit under the tracks at the discharging end. The heat is maintained and can be increased by a system of floor piping and side wall coils. It should be mentioned that in the heating apparatus of the "Standard", the design is to prevent leakage by good construction and the use of first-class material. All pipe is made from selected stock, especially for this purpose, and is provided with extra long threads and long, heavy couplings; also with heavy cast-iron headers, which are four times as thick as the ordinary wrought-iron headers. Moreover, the most ample provision is made for expansion and contraction. All pipes are accessible for inspection and, in the rare case of such necessity, for repair.

Steam is admitted direct from the boiler to the floor piping and side wall coils at the receiving end of the drier, circulating then through the entire heating system, which is provided with outlet manifolds, connecting with a drain or equalizing tank located in the air pit at the discharging end of the drier. This tank communicates with a reservoir in the boiler room. The water of condensation is conveyed by separate pipes from the primary heater and wall coils to the drain tank. From here the water is forced into the reservoir, and by an automatic trap is put back into the boiler at a high temperature. A great saving in fuel is thus effected by feeding the boiler with hot water.

A point to which the maker directs particular attention is that the cold air, before entering the drier proper, is heated to a high degree by spent steam in the primary heater, at no cost, whereas in other steam driers direct steam is required. This is an important economical feature, and is put forward as one of the strong points of the "Standard".

Another feature on which the maker lays stress is the simplicity of construction, there being no engines or other complicated machinery requiring expert attention and liable to require expert attention and liable to require repairs or break down in service. There is freedom from fire risks, and the company states that recent improvements wherein steel is used in constructing the building makes the investment a permanent one, not subject to depreciation.

New Powers in the Trade.

The Peebles Paving Brick Co., of Portsmouth, O., capitalized at $50,000, has been incorporated.

The Barkwill Brick Co., of Cleveland, O., has been incorporated with a capital stock of $25,000.

The National Brick & Tile Co., of Detroit, Mich., has been incorporated with $30,000 capital stock.

The Croton Limestone & Brick Co., of New Castle, Pa., has been incorporated with a capital stock of $30,000.

The Whittier (Cal.) Brick Co. has been organized by J. C. Hiatt, J. H. Linkletter, T. F. Hensley and John Cole.

The Michigan Ornamental Brick Co., Detroit, has been organized by D. J. McKinnon, James A. Randall and Joseph Brent.

The Dover (Ky.) Brick & Tile Co., capitalized at $6,000, has been incorporated by George M. Clinger and John and Walter Wilson.

The Lake View Brick Co., of Chicago, capitalized at $30,000, has been incorporated by F. W. Raymond, F. T. Sullivan and J. H. Graf.

The Denton (Tex.) Pressed Brick Co., capitalized at $30,000, has been incorporated by William Bryce, W. S. Wilson and W. M. Dugan.

The Havelin & Martin Tile Works Co. has been incorporated with a capital stock of $75,000, and projects a new brick plant at Le Clair, Ia.

The Kenton (Tenn.) Brick & Tile Co., capitalized at $10,000, has been granted a charter. The incorporators are: G. P. Hurt, C. A. Derryberry and T. McDonald.

Corneer Brothers & Croft Brick Co., of Omaha, Neb., has been incorporated and proposes to erect and equip a modern brick plant in Omaha at the cost of $10,000.

The Evansville (Ind.) Pressed Brick Co., capitalized at $44,000, has been incorporated by Herbert S. and George W. Lant, Robert Dunkerson and Alexander Gilchrist.

The Acme Brick & Clay Co., of Pueblo, Col., capitalized at $25,000, has been incorporated by W. H. Thompson, G. J. Piper, J. A. Wann, Aaron Sonneborn and H. Pollard.

The Donley Brick Co., of Washington, Pa., capitalized at $25,000, has been granted a charter. G. E. Lockhart, J. K. Mitchell, A. M. McElroy and James E. Murray, of Washington, directors.

The Terry Brothers Co., of Kingston, N. Y., capitalized at $80,000, has been incorporated and proposes to build a large brick plant at Kingston. Albert, David and Jay Terry are interested.

The Reus Klos Gongrau Co., of Hohen Solms, La., has been incorporated with $30,000 capital stock to manufacture brick, tile and sewer pipe. A large plant will be erected at Hohen Solms.

The Auburn Shale Brick Co., capitalized at $100,000, has been incorporated by W. Van Reed, George C. Ruth and W. H. Morris, who project the erection of a large brick plant in New Jersey. General offices have been opened in the Guarantee & Trust Building, Camden, N. J.

The Hodges Brick Co., capitalized at $25,000 and proposing to erect a large plant at Meridian, Miss., has been incorporated by Isaac Champenois, C. W. Robinson, Oswald Hodges and others.

The C. F. Thomas & Son Brick Co., of Buckeystown, Md., has been incorporated by C. F. Thomas, W. H. Thomas, A. W. Nicodemus and J. H. Baker. The company has an authorized capital of $35,000.

The Ohio River Clay Co., of Kenilworth, W. Va., has been incorporated with an authorized capital stock of $150,000, by W. A. Park and J. S. Edwards, of Rochester, Pa., and John J. Martin, of Congo, W. Va.

The New Garden Pottery Co., of Taughkenaman, Pa., has been incorporated with a capital stock of $75,000 by S. H. Worth, of Taughkenaman; P. A. Marvel, of Avondale, and Josiah Marvel, of Wilmington, Del.

The Brook Terra Cotta, Tile & Brick Co., of Brook, Newton County, Ind., has been incorporated with a capital stock of $30,000. Among the directors are: J. H. Hayes, L. E. Lyons, Edward Hess and W. W. Shearer.

The Pittsburg Consolidated Coal & Coke Co., recently organized with a capital stock of $150,000, has decided to build a brick plant at New Galilee, Beaver County, Pa., where a tract of 98 acres of clay lands has been purchased. C. E. Pool and F. H. Gregg, of Pittsburg, are interested.

The Virginia Brick Co., of Fredericksburg, Va., has been organized under the laws of New Jersey with a capital stock of $30,000 and proposes to erect a plant for the manufacture of front and ornamental brick at Fredericksburg. Henry Warden, William D. Carter and Dr. J. N. Barney are interested.

The Beaver Clay Manufacturing Co., of Beaver Falls, Pa., has been incorporated with $50,000 capital stock by James H. Cooper, F. N. Beegle, B. B. Todd and Eugene S. Hoopes to manufacture enameled tile, enameled firebrick, building brick and other clay products. A large plant will be erected near Beaver Falls.

The Kingston-Clarks Brick & Tile Co., of Kingston, N. C., has been incorporated with a present capitalization of $10,000 and the privilege of increasing that amount to $50,000. The company is a consolidation of the brickmaking firms of L. Harvey & Son and Abbott & Jones. S. H. Abbott is president of the new company.

The Monongahela Valley Brick Co., of Pittsburg, Pa., has applied for a charter, having for its object the manufacture of standard red brick, red brick for facing purposes, buff building brick and firebrick. It is estimated that the output of the proposed plant, which will be located near Monongahela, will be 50,000 brick per day. Joseph McK. Speer is president of the company.

Thomas Canfield and James Cromie will open a new brickyard has an annual output of about 300,000,000 brick.

The Coaldale (Ala.) Paving Brick Co. has enlarged and otherwise improved its plant, and is now turning out 30,000 paving brick per day.

A MONTH IN THE WORLD'S HISTORY

His Royal Highness Prince Henry of Prussia, brother to the German emperor, has paid his respects to Uncle Sam in a brief but memorable visit to the United States, which was made the occasion of international amenities of a highly gratifying character, and was marked by "painted pomp" to a most extraordinary degree in the manner of its celebration by American people. After visiting New York, Washington, Chicago and other cities of the East and South, the Prince sailed for "sein Vaterland" on board the liner Deutschland, March 11th, impressed with the hospitality of his American hosts and glad enough for respite from an endless chain system of banqueting, hand shaking and speech making with which the importance of the royal tourist had been recognized. It is said that in the excess of their hospitality, Prince Henry's entertainers gave him nothing to eat less expensive and indigestible than terrapin and turkey capon, and that before he left Columbia's shore His Highness had a homesick longing for simple, unpretentious fare—for instance, Weinerschnitzel—and beer, plain beer. The visit of the Prince to this country had no ulterior political object as some newspaper asseverated. It was merely significant of the friendly relations existing between Germany and the United States, while it afforded curious Americans an opportunity to behold for once the real thing in the way of royalty.

March 3rd, reports stated that the rebel steamer Bolivar was bombarding Guayra, a Venezuelan seaport, in order to protect the landing of insurgents. Heavy fighting was in progress in the State of Caraboba, and troops were sent to defend the city of Bogota, Colombia, from the attacks of the rebels.

March 6th, the Spanish Treaty Claims Commission decided against the claimants for damages resulting from the destruction of the battleship Maine.

March 7th, one of the most memorable battles in the Boer war in South Africa took place before daybreak in the western part of the Orange River Colony, resulting in the capture of the British General Lord Methuen, by the Boer General Delarey, and in a galling defeat to the British which may have the effect of prolonging the war indefinitely. A force of 1,200 British soldiers was surprised and stampeded by 1,500 Boers in British khaki, and after an engagement in which 41 were killed and 70 wounded, Lord Methuen and 200 others were made prisoners. Five hundred of the British mounted yeomanry were chased by the Boers for four miles, so that the victory of the latter was complete. While it is maintained in some quarters that Delarey and his men violated the laws of war by masquerading, as it were, in the enemy's own uniform when the attack was made, there are many disposed to praise the brilliancy and daring of his tactics. Delarey is, moreover, humane and has accorded kind treatment to his enemy, Methuen having been wounded in the thigh in the skirmish previous to his capture. What disposition will be made of Methuen is uncertain. It has been suggested that the British general may be held by the Boers as a hostage for the personal safety of Kritzinger, now on trial for treason, and again that the Boers may offer to exchange Methuen for Cronje, who is a prisoner at St. Helena. Prior to his recent capture General Methuen's record in South Africa has been a good one. He won the battles at Belmont and at Enslin in which his present captor, Delarey, opposed him, and on April 15, 1900, achieved a signal victory in a skirmish with a Boer force under Colonel de Villebois-Marcuil, the latter being killed.

Cecil Rhodes, who after a protracted illness died March 26th, is to be remembered as the man who has accomplished more than any other toward the development of the English colonies in South Africa. His long and bitter feud with President Kruger of the Orange Free State and his animosity toward all Boers were among the indirect causes of the present war. Mr. Rhodes was born to wealth and position, but for the sake of recuperating his health left England in his youth and made his home in South Africa. He became interested in the diamond mines in the Kimberly district and effected a consolidation of the different mining companies there, which resulted in limiting the output of diamonds and in keeping their prices up. He built railroads and founded towns, securing and improving for England vast tracts of African territory north and west of the Transvaal republic, and it is said to have been his aim to "change the map of Africa so that a broad strip of red should mark British possessions from the Mediterranean to the Cape of Good Hope."

March 8th, the Philippine Tariff bill was signed by President Roosevelt. It was subsequently announced that General J. H. Smith, commander of the American troops in Samar, had arranged an armistice with the insurgent General Guevarra, who surrendered with his entire force and all arms and ammunition. Guevarra riflemen number approximately 400, and it is said that the rebels will receive $30 for each rifle surrendered to the American commander.

King Edward VII was a busy man last month with the preparations for his approaching coronation, and the event of the first court reception of his reign, which occurred on the 14th ult. Rumor has it that his majesty has revived the old vice of snuff taking, a pernicious habit which in this instance, however, may be excused since etiquette forbids the King to smoke a pipe around the house. If anglomaniacs, incited by the royal example, attempt to introduce the practice of snuffing and sneezing in this country, measures for its suppression will be taken by the Board of Health. There is no limit to the dire possibilities if the vice should get the upper hand. Instead of smoking cars we should have sneezing cars on railroad trains, and Kansas reformers would wield the hatchet on all who sneezed without stopping to inquire whether the victim were indeed a snuff-fiend or had sneezed because he had just cause. It is in little matters of this kind that the power of kings is felt. Edward VII is to be crowned in June. Perhaps snuff has already affected his amiability for it is reported that the king purposes to allow no Americans or other foreigners to be present in Westminster Abbey on this glad occasion to see the show.

A strong memorial against the reenactment of the Chinese exclusion law by the United States has been presented to Minister Conger at Pekin. The Chinese government objects in particular to the exclusion of Chinese from the Philippine and Hawaiian Islands, representing that the Chinese have acquired extensive commercial interests there and are closely connected with the islands by family ties.

Pacific Coast Letter.

During the last few weeks a number of big building contracts have been let for large structures in San Francisco. Several of them were for fine brick and stone fire-proof structure for hotel and office purposes. There has been a great influx of new people and house room of all kinds is scarce and rents are going up. As a result of the scarcity of residences, more and more people are constantly moving to the suburbs. The ferry systems are taxed and have recently been obliged to increase their capacity. All this is having its natural beneficial effect on building, and with the price of lumber going up and that of brick going down there is every reason to expect that there will be a favorable increase in the percentage of brick buildings erected this year.

The Huennekes system of making bricks is soon to be tried on this coast by the Pacific Sand & Lime Brick Co. This company has established offices at 137 Montgomery St., San Francisco. The officials of the company state that arrangements have been made for the erection of factories at the different centers along the coast. The company claims to be able to sell the new bricks at $15 per thousand or just half the price of the dry pressed brick, which the new bricks are expected to supplant. It is not the intention to compete with common brick, but with pressed and cement brick. It is claimed that the sand of California is especially adapted for the manufacturing of sand and lime brick.

The Public Utilities Committee of the Board of Supervisors of San Francisco has recommended the holding of an election for the purpose of voting bonds to the amount of $5,600 for the purpose of constructing an extensive sewer system.

Theodore W. Peterson, the pioneer brickmaker of San Jose, Cal., and one of the best known brick men in the state, died quite suddenly at St. Luke's Hospital in this city on March 10th. His death was due to heart failure. Mr. Peterson is regarded as the father of the pressed brick industry in this state. It is said that there is scarcely a modern building in San Francisco, or in fact in any of the larger cities of the coast which does not contain some of the products of his industry. He was born in Schleswig-Holstein, in 1837, and came to the United States when 20 years of age. At the time of his death he owned and operated seven pressed brick factories.

Emmett Riggins, manager of the Fresno Brick & Tile Co., at Fresno, Cal., says that the outlook for the brick business in the San Joaquin Valley is better than it was at this time last year. This company manufactured 2,000,000 brick last year, nearly all of which have been sold. Last year, owing to strikes in the east the company was not able to secure its machinery as early as was expected, and as a result its output was curtailed considerably. All the machinery is now in place, however, and the company expects to put 4,000,000 bricks on the market this season. All bricks made in the San Joaquin Valley are sun-dried. It would not pay to have a drier when there are so many months of sunshine, so the yards cannot be opened before the first of April, and even later should the spring be a wet one. In San Francisco, owing to the prevalence of fogs, even in summer, driers are used and the yards are operated the year round. The installation of the yard operated by the Fresno Brick & Tile Co. last spring proved a great benefit to the San Joaquin Valley, as the price of bricks was materially reduced. Up to that time bricks sold for unreasonably high prices, but as soon as the new kiln opened, the price of ordinary bricks dropped from $10 per thousand to $6 and $8 per thousand. The old factory, however, puts out two grades, which sell for $6 and $25 per thousand.

S. P. Rhoades has been granted a permit by the Los Angeles council to maintain and operate a brickyard in the Garibaldi Canyon, about a half a mile from the Chaved Ravine road.

A contract for 600,000 bricks to be used in the construction of a smelter for the Chelan Transportation & Smelting Co., on the Columbia river, has been let to A. O. Fowler, of Chelan, Wash. It is expected that the smelter will be in operation early in 1903.

The contract for the brick work on the new school at Prescott, Ariz., has been let by the school trustees to Fitzsimmons & Keating for $8,120. The building complete will cost about $35,000.

Harris & Mahan are considering the question of acquiring the brick clay land just north of Sedro-Wooley, Wash., and of establishing a plant for the manufacture of a high grade of brick and tile.

The Standard Brick Co. is a new brickmaking corporation at Los Angeles. The company has purchased the site and plant of the brickyard at Boyle Heights, formerly operated by Metzall, but nothing of the latter will be kept but the land. The new concern has purchased the most modern machinery, which is now on the way from Chicago. Several kinds of brick will be manufactured. In addition to the ordinary red brick, the company will put on the market the latest improvements in buiding material, or the vitreous-faced pressed brick. The capital stock of the company is $25,000, fully paid up, all of which will be used in the plant and machinery. Warren Gillelen, R. W. Kennedy, H. W. Simons, Ralph Simons and John V. Simons constitute the directorate of the company. The plant will be in charge of the Simons brothers.

An ordinance has been introduced in the city council of Spokane, Wash., providing that in the future all sidewalks within the fire limits shall be either of asphalt, brick or cement. Wooden sidewalks are expressly forbidden.

The Alger Oil & Mineral Co., of Fairhaven, Wash., has closed a contract with the American Clay Working Machinery Co., of Ohio, for a modern and up-to-date brick-making machine.

Alfred Boole, of East Orange, N. J., died of consumption in Phoenix, Arizona, on March 10th, after a four months' stay in that city. He was a well known manufacturer of tiling. Mr. Boole was fifty-two years of age at the time of his death.

The Los Angeles Brick & Terra Co. has filed an application with the city council for a permit to maintain a brickyard on lots 3 to 13 inclusive of the Beaudry tract, that city.

The immense stone quarry on Bear River, near Colfax, Cal., has been transferred to the H. T. Holmes Co., which will install a patent lime kiln, with a capacity of a carload of lime per day. It is claimed that lime can be burned at this quarry cheaper, on account of fuel facilities, than at any other point in California. The new patent kiln is constructed in a circle of firebrick and sheet iron about 60 ft. high. Ten bins are provided with a capacity of drawing out 2,000 lb. each per hour. The quarry in question is on the Placer County side of Bear River and is commonly known as the marble quarry. The deposit makes a lime of excellent quality, a number of kilns of it having been burned in early days.

J. T. Davie & Co., who have been operating a brick manufacturing plant at Crystal Springs, Wash., announce their intention of moving the plant from that place to a location near Mead. They will then enlarge the plant by the addition of new machinery and by starting the manufacture of a stiff mud and wire cut brick.

A company has been organized at Colville, Wash., for the purpose of establishing a cement manufacturing plant at Metaline, on the Pend d'Oreille River, Wash.

Rowell & Croner are now putting in machinery for a tile factory at Scholls, Oregon.

The Elk Firebrick Co., of St. Mary's, Pa., capitalized at $50,000, has been granted a charter.

The Muskingum Pottery Co., of Zanesville, O., has sold its plant to John F. Weaver, of Roseville, O.

Echoes from the Trade

J. D. Fate & Co., of Plymouth, O., have just shipped the American Enameled Brick & Tile Co., of South River, N. J., the second outfit of machinery and the National Tile Roofing Co., of Lima, O., the second car load of machinery for its new works. Fate & Co. are very busy and are compelled to work nights in order to get up the work.

Evans & Howard Fire Brick Co., of St. Louis, makers of high grade sewer and culvert pipe for railroad construction, decorative tiles, cupola and furnace blocks, fire brick and flue linings reports excellent business for the past season. The approaching World's Fair at St. Louis has given quite an impetus to the regular business and the company is making ample preparation for the increased demand for its products.

Several months ago the Burt Manufacturing Co., of Akron, O., received an order for a "Cross" oil filter from the engineers of the great Calumet & Hecla copper mine. It did such good work that since then the Burt company has received six additional orders from them. An advertising phrase used in connection with this filter has been that "It saves 50 per cent on your oil bills," and it is to be supposed that the "Cross" oil filters are earning as big dividends on their cost as any of the more pretentious machinery for which the Calumet & Hecla plant is noted.

Adam Cook's Sons, New York City, offer to send, free of charge, a sample can of their celebrated lubricant "Albany" to all users of lubricating mediums. These testing samples have given satisfaction wherever sent, as may be judged by the following testimonial: O. P. Lechner, engineer for the American Fire Brick & Clay Co., Mineral City, O., writes under date of March 1, 1901: "Some time ago I received a sample can of grease and an Albany cup for a test. I made a guess as to the amount of grease the can contained at 2 ounces. It made a run of 35 hours on a shaft governor eccentric that runs a little warm. Your grease is all you claim for it. It is the finest grease I ever used."

The Allis-Chalmers Co., of Chicago, Ill., is mailing the 9th edition of its catalog No. 7, which presents to the public in a most practical manner the wonderful variety of perforated products supplied by this company. To meet the increasing demand for these perforated goods the company has had to increase the equipment by a number of new machines of the most improved type and now considers itself able to meet all the demands for these goods in a prompt and satisfactory manner. Perforated metals are claimed to be far superior to wire cloth, being much stronger, more uniform in size of hole or mesh and less liable to tear or rust out. In case of breakage they are easy to repair and if it is desired to arrange screens with certain portions flank this can easily be done with perforated metals where it is impossible with wire cloth. The smoothness of the surface of the former allows the ground ore or other material to pass through it readily and quickly. The catalog contains some 50 pages, the majority of which are devoted to illustrations, to scale of all the different kinds of screens for various materials supplied by the firm. These have an immense range and among them may be quoted round-hole screens for placer grizzleys, square-hole, needle slot, phosphate and dry pan screens. Several interesting types of revolving screens are also shown, adaptable for any class of material which needs screening. The catalog concludes with several pages of most interesting tabular matter such as a table showing the weight per square inch of different sheet metals, comparative table of United States and French measures and specific gravity and weight of materials.

The Means Foundry & Machine Co., Steubenville, O., has issued a neat catalog illustrative of the special lines of sewer pipe presses which the company places on the market. Special attention is called to the horizontal piston valve in the machine and the steam cylinder takes its steam direct through the top and bottom heads giving direct and additional force. All clay cylinders have bushings which can be removed and replaced with new ones without disturbing any other part of the appliance. A special feature of the company's output are sewer pipe dies which are produced in any size from 1 in. to 36 in. in double and single strength. The company also manufactures wheel platform trucks, barrows and clay cars. All kinds of supplies are kept in stock for dry pans and pugmill castings and all repairs may be had very promptly. A special machine placed on the market by the company is the "Grand Automatic." It is especially constructed to temper and melt very stiff clay developing perfectly the corners and the edges of the brick, the product being a strong, first class brick. From 6 to 10 h. p. is required to run it. At its full capacity it turns out 16 molds per minute or an average capacity of 5,000 brick per hour. Further information can be secured from the company and when you write, mention "Brick".

The American Clayworking Machinery Co., Bucyrus, O., has just issued its 1902 catalog which, if it can be possible, is an improvement on that of 1901. The cover is handsomely designed and printed in colors. Two angels support the world with one hand while with the other hand they point to the motto of the company, within a laurel wreath "Built Right, Run Right". Our theological education has been too much neglected for us to be able to state definitely whether the angels are "built right", but from the latent power indicated by their immense wings, we should be prepared to believe that they would "run right." The catalog is a volume of some 270 pages, on every one of which appears an illustration of one of the many machines issued by this company. The American Clayworking Machinery Co. claims to be the only firm in the world which builds machinery for the manufacture of clay products for all known purposes and the variety and extent of the machinery portrayed in the catalog goes far to substantiate this claim. From the digging of the clay to the delivery of the finished product all machinery and appliances required the company supplies, including the stiff-mud, dry press, soft mud brick, tile machinery and pottery and cement machinery. It would be impossible for us in this limited space to describe any one of the many lines carried by the company but those interested can obtain a catalog and all information required by applying to the company. When you write, mention "Brick".

The Cortis Manufacturing Co., of Meriden, Conn., is well known as the maker of taking advertising novelties. One of the latest of these placed upon the market is an exceedingly valuable advertising rule. They term it "a rule of three" good features, in that it is made of the best selected hard wood with brass cutting edge, embodies a practical, all-around lead pencil sharpener and as an advertising novelty, no more sensible one could possibly be conceived. The name, address and advertising matter of the purchaser of these in quantities is printed on the rule at favorable prices and it is an advertising medium of the highest value in that the rule will remain on the desk of the recipient for its actual use to the possessor.

Some of the literature that the company send out is well worth reading and among other things which the Cortis Manufacturing Co. calls attention to is that the lead in the pencil is a mixture of graphite and clay molded and pressed into shape and baked, differing only from a brick in the amount of clay used. The file-like cutter inserted in the rule is entirely efficacious in sharpening the pencil neatly and satisfactorily, for the lead is supported from both sides while being sharpened and under these conditions the point of the pencil will not break but can be brought to the fineness of a needle without soiling the fingers. A long or short point can be produced at will according to the angle at which the pencil is held. Information and prices of this rule can be obtained from the manufacturer. When you write mention "Brick".

The Leader Manufacturing Co., of Decatur, Ill., reports excellent business and has to work over time to catch up in any way with its orders. We are pleased to hear that many inquiries have been made through the extensive circulation of "Brick" amongst responsible financial parties.

The Frost Manufacturing Co., of Chicago, has just closed with the Hydraulic Press Brick Co., of St. Louis, for four 9-ft. iron frame dry pans for the new plant at Kings Highway and the Missouri Pacific Ry. tracks, St. Louis, and also for two 9-ft. iron frame pans for the Myers Brick Co., at Dallas, Tex.

Geo. Nash & Co., of Chicago and New York, who are probably the largest importers of piano wire in the United States, have made a specialty of furnishing the highest grade of piano wire especially drawn for the purpose of cutting brick and tile. It is claimed that this wire, on account of its special nature, can cut many times more brick and tile than any wire which has heretofore been produced.

New York State School of Clayworking Ceramics of Alfred, N. Y., has just issued its prospectus which is abundantly illustrated with handsome half tones illustrating the various processes of manufacture carried on in the school and contains a lucid exposition of the tuition offered by the school and the benefits to be derived therefrom and all the requisite information concerning entrance requirements and admission by certificate or examination. Under the able leadership of Professors Binns and Babcock we feel sure that the students of the ceramic school in Alfred University will acquire much knowledge and subsequent distinction.

J. M. Graves, secretary of the McRoy Clay Works, Brazil, Ind., writes in reference to the "Ohio" automatic feed pump and receiver as follows: "Replying to your favor of March 8th, we can say with pleasure that the automatic feed pump and receiver which we recently installed, commenced at once to perform the work we expected of it, and is doing so now to our satisfaction." The Ohio Steam Pump Co., Canton, Ohio, manufacturer of these machines, is enjoying the most excellent trade for them among brick and clay working plants. It has already installed its machines in plants ranging from the Atlantic to the Pacific, and customers are receiving the very best of results from them. These machines are quite inexpensive, and it is said that they save their cost in a very short time.

The Reese-Hammond Fire Brick Co., Bolivar, Pa., is issuing to its customers one of the most attractive calendars that it has ever been our pleasure to see. The ground of the calendar is a light olive green and in relief is a medallion whose subject is the well-known portrayal of "Love's Dream"; a beautiful young woman sleeping, is being embraced by an artistically-designed cupid and the outline effects are admirable. High grade work of this character is well calculated to impress the recipient of the calendar with the dignity of the company which sends it out and we congratulate the Reese-Hammond Fire Brick Co. on its artistic choice. The products of the company have long occupied a premier position in the manufacturing world and last season's output exceeded all others in variety and quantity.

The Davis-Price Foundry & Machine Co., New Cumberland,, W. Va., has mailed us its latest catalog of specialties and supplies which is specially adapted to give a comprehensive idea of the lines of manufacture of this company. The clayworking machinery of the Davis-Price Foundry & Machine Co. has already acquired a national reputation and one of the machines which is gaining much approbation is the sewer pipe press which is made in any size of steam and clay cylinder which may be desired by the manufacturer. A number of sewer pipe dies of any flange demanded are also supplied and the usual brickyard equipment of brick, clay and pipe barrows, trucks, clay and coal cars, dry pans, etc., can be obtained by this company while the repair and supply department is one of the most extensive and varied in the United States. A postal card will birng this catalog to those interested, and when you write mention "Brick."

The Henry Martin Brick Machine Manufacturing Co., Lancaster, Pa., has issued its annual catalog No. 60, describing soft mud, wire cut and dry press brick machinery, of Martin manufacture. The various types of complete equipments for either steam or animal power plants are described and illustrated in detail, prominence being given to the Henry Martin style "A" steam power brick machine of 10,500 lbs. weight, requiring 10 h. p. for its operation. This machine has all the latest improvements such as an automatic mold protector which prevents any damage to the molds or machine if, by accident, the mold should not be pushed all the way in and thereby come in contact with the post or braces. The patent automatic self brake is another important feature. By its use the tops of the molds are cleaned as they come from beneath the press box, the automatic strike cutting off all superfluous clay as clean and close as it would be possible to do it by hand. The improved press box, improved gate and self packing plunger are other notable advantages which any brickmaker will appreciate on reading a description of them in Martin's latest catalog. The capacity of this machine is from 35,000 to 50,000 brick per day of 10 hours, depending only upon the facilities for feeding the clay into the machine and taking care of the brick when made. The merit of the Martin machines is well known to brickmakers throughout the United States, Europe and South America.

John C. Boss, Elkhart, Ind., is presenting brickmakers with a new catalog describing the Boss system of burning brick, a simple method by which, it is claimed, a great saving in time and money can be effected. The apparatus required consists of hollow cast-iron air boxes or burners which can be conveniently installed and will work equally as well in one kiln as another, whether the kiln be of permanent wall construction, of the old scoved shape, or the patent down draft type. The end of the cast-iron thimble, which is cast solid to and is a part of the burner, contains a small bell, slightly flaring in such a way that a cast-iron pipe will fit into it and make a good joint. The pipe is in two-foot lengths, the advantage over an ordinary three-inch sewer pipe being that the cast-iron pipe can be laid near the surface of the ground without danger of breaking when heavy loads pass over it. With the Boss system the fire can be regulated and kept in any desired condition independent of the weather or the direction of the wind, thus insuring a uniform and perfect quality of brick. The doors are kept closed, and all the air enters from beneath and passes through the fuel, the necessity of cross-firing being obviated.

The Boss system has many other advantages which are plainly stated and illustrated in the catalog. A complete system of blue prints, giving working-drawings and full description is furnished with every contract for the Boss system of brick burning, so that any brickmaker can easily install the system; or, if desired a competent man is sent to the customer's yard to effect the installation.

The Frost Manufacturing Co., of Chicago, has just sold to the new brick company at Cherryvale, Kan., known as the Cherryvale Press Brick Co., two 9-ft. Frost iron frame dry pans.

The Illinois Hydraulic Press Brick Co., of St. Louis, has favored us with three samples of its mottled and Pompeiian brick, one of the many products of this company which has won a great reputation. Each brick is hollowed out to serve as a match receiver and is mounted on rubber buttons, thus being useful and ornamental as well as showing in an admirable manner the excellent quality of the company's product.

The Under-Feed Stoker Co., of America, reports contracts with the following companies closed since our last issue: Arcade Bldg., Cleveland; Muncie, Hartford & Ft. Wayne Electric R. R.; Permanent Bldg., Cleveland; New England Bldg., Cleveland; Cleveland Crane & Car Co.; Ohio Farmers Fertilizers Co., Columbus, O.; Superior Steel Co., Carnegie Pa.; Citizens Electric Lighting & Power Co. (15,600 h. p.), St. Louis; Niles & Scott Co., LaPorte, Ind. (second order); Montreal Mining Co., Hurley, Wis. (second order); La Grange (Ill.) Light & Water Works Co. (second order). The Toronto office of the company has also sales of Jones under-feed stokers aggregating 7,450 h. p.

Personal.

Mr. Pickard, of the firm of Clark & Pickard, brick manufacturers, Minonk, Ill., is spending the spring months in California, with his family.

The Mattoon (Ill.) Brick & Tile Co. has elected the following officers: William Bryant, president; A. I. Rhue, vice-president, and Theodore Jonte, secretary and manager.

The Vigo Clay Co., Terre Haute, Ind., has re-elected its officers as follows: A. J. Crawford, president; Louis Duenweg, vice-president; J. A. Dailey, secretary and treasurer, and H. S. Preston, general manager.

George H. Drew, formerly superintendent of the Illinois Brick Co's. yard No. 23 at Blue Island, Ill., is reported to have severed that connection to accept a position with the F. H. Wolf Brick Co., of Detroit, Mich.

E. P. Stevens, formerly of Chicago, will be manager of the extensive plant at Scioto Furnace, O., in which Mr. Stevens and Thomas Moulding recently purchased a controlling interest from the Buckeye Firebrick Co.

H. A. Perkins has resigned as secretary and treasurer of the Brooklyn (N. Y.) Firebrick Works, and is now associated with the Newton-Perkins Firebrick Co., of Albany, successors to the old firm of Newton & Co.

Philadelphia capitalists contemplate erecting a large brick plant at North East, Pa.

Fires and Accidents.

The Ironsides Pottery Co's. plant, East Liverpool, O., was damaged to the extent of $4,000, March 8th, as the result of an overflow of the river.

Patterson Brothers' Pioneer Pottery, of Wellsville, O., was damaged to the extent of $8,000 by a fire on the morning of March 23rd. The loss was fully covered by insurance, and repairs have been effected.

Fire which broke out in the scalehouse of the Reese-Hammond Fire Brick Co.'s plant at Bolivar, Pa., March 8th, destroyed a large portion of the works and entailed a loss of several thousands of dollars, covered by insurance.

The Reading (Pa.) Terra Cotta Works was totally burned on the night of March 1st, causing a loss of $30,000. Floods had previously done considerable damage to the plant, and had isolated it so that all efforts of the firemen to reach the burning buildings were unavailing.

The J. B. Owens Pottery Co's. plant at Zanesville, O., was destroyed by fire March 2d, the buildings and their contents being a total loss. The fire started in the engine room and spread with great rapidity, an explosion of chemicals tearing down the walls of the main building and helping to scatter the conflagration. The disaster left 400 employes temporarily without work. The company's loss is estimated at $250,000, with $140,000 insurance. The plant will be rebuilt at once.

Stephen W. and Thomas Joyce have begun the erection of a plant at Grafton, W. Va., which will have a capacity of 35,000 brick per day. The plant is estimated to cost $30,000.

S. J. Stubbs, D. W. Jeter and H. N. Fagin, of Macon, Ga., project the establishment of a new brick plant at Port Vincent, La., which will have an annual capacity of 30,000,000 brick.

The Peters & Reed Pottery Co., South Zanesville, O., has erected a number of new buildings and installed a new boiler and engine. Some specialties in art ware will be introduced by Adam Reed, president of the company.

C. G. Barkwill, of Cleveland, O., has transferred several acres of property at the foot of Herald St., in that city, to the Barkwill Brick Co., in which he is a stockholder. The land is intended as a site for a new brick yard.

BRICK

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We want our readers to feel always that BRICK is their paper, and that what interests them interests its publishers and subscribers. We will therefore appreciate most highly any communications, questions, experiences or suggestions, or marked copies of local papers containing items of news pertaining to the interests of clayworking.

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"Brick" has almost completed its eighth year and the publishers take pardonable pride in looking over the shelves where all the volumes from I to XV repose, and noting how the paper has steadily advanced in the quantity and especially the quality of its reading matter and in the attractiveness of its mechanical make-up. It gives us even greater satisfaction to know that with each number "Brick" takes a firmer grip on the minds and hearts of its old readers, and also adds to the number of subscribers.

The lusty infant of July, 1894, has grown to manhood and with firm tread is marching onward. Behind it are all the shadows of early adversity and the taunts of juvenility, and dire predictions as to the future are seldom heard. Nowadays jealousy manifests itself not by open criticism, but by sly inuendo.

We feel that the position which "Brick" has achieved is the result of its independence, the entire absence of bias, and a steady adherence to its purpose of publishing information of real value to its readers. There has never been any expense spared to make "Brick" the best. After this issue is printed "Brick" will remove to its new quarters at Nos. 45 and 47 Plymouth Place, Chicago, but there will be no change in its policy, and the aim of "Brick" will continue to be that of supplying its readers with useful information. This we conceive to be the true object of a technical journal that is worthy of the name.

A first-class technical journal always has at hand so much matter that the task is to carefully choose for publication what will best serve the largest number of readers. The limitations of space, therefore, almost invariably compel the leading paper in its field to omit matter that while interesting is not of permanent value, which its contemporaries are glad to use for the sake of filling. Thus it is seldom that the demands on its space will permit "Brick" to give verbatim convention reports because there is necessarily much in them that depends upon local coloring, the personality of the speakers, or the momentary feeling of the audience. A clever story or an apt illustration will at the time be most effective in placing a speaker in sympathy with his hearers, but 60 days later it will not help our readers to make bricks.

The Value of Clay Analysis.

A great many clayworkers feel that an analysis of their clay and some advice from an expert would probably assist them in their work, but too often they do not think that they can afford to pay for this service what the expert charges. This feeling that advice is not worth paying for is a mistaken notion and generally comes from lack of experience. Successful men realize that even if lawyers have the reputation of exacting large fees, the money is well spent. An instance of not consulting a lawyer in time recently came to our notice; a note was dated Chicago when the money was loaned in a western state, and was for a rate of interest that was illegal in Illinois. The man who lent the money has already paid his attorney $250 for services in collecting, when at the time the note was made he could have got all the advice he needed for $10. Ten dollars may seem a good deal to pay in order to learn that you ought to write "Chicago" instead of "Denver," but $10 is still $240 less than $250.

To some extent the same reasoning applies to clay experts that does to law experts. It costs money and takes time to make an analysis, it costs money and takes time to acquire the knowledge necessary before one can give the advice that may prevent an investment in a worthless property, or lead to an annual saving that will pay the expert's fee fifty times over. Too often a loss is allowed to continue year after year because the manufacturer does not see the loss, while he does see the $25 or $50 that the expert might charge him.

The Cowgill tile factory, Summitville, Ind., recently shut down for two days owing to an insufficient supply of gas. The factory is running at its full capacity this season, employing 100 men.

Local capitalists propose erecting a plant at Bay City, Mich., for the manufacture of brick by a new German process which does not use fire and is alleged to turn out the finished brick within 12 hours after the material leaves the press.

William Reddy and Cornelius McCormack, brick manufacturers of Spokane, Wash., project the erection of an extensive brick manufactory at Coeur d'Alene. The clay deposits in the vicinity are of three distinct varieties, and of superior quality.

The Decatur (Ill.) Brick Co. began operations at its two plants, March 6th, the start being made unusually early this season owing to the number of contracts on hand. The company will furnish the brick to be used in the erection of the Milliken University buildings.

George W. Lischer, mayor of Mascoutah, Ill., and John Fackt have formed a partnership for the manufacture of brick, and have purchased the Weidler brickyard at Mascoutah from Charles Weidler and John Lerch. Extensive improvements of the yards will be made, and brick shipped to St. Louis and other markets.

The Kelly Brick Co., a new concern, has purchased the Logan Machine Brick Works, at McKeesport, Pa., for a price approximating $20,000, and will remodel the plant and install new machinery. The output will be increased and an additional force employed. W. W. Kelly is at the head of the new company.

The Hutchinson-Barnes Brick Co., which was recently organized at Fairmont, W. Va., will soon begin the erection of a modern brick plant in that city, and will purchase a complete equipment including a 10-ton drier and several kilns. The plant will have an output of 45,000 brick per day. M. L. Hutchinson is president and P. I. Brett, manager, of the company.

Effect of Road Surfaces on Tractive Effort Required.

The following data are taken from an article by Prof. Ira O. Baker, M. Am. Soc. C. E., professor of Civil Engineering in the University of Illinois, published in Engineering News, Mar. 6, 1902, page 182, and give the results of experiments made by Professor Baker on the tractive resistance of different pavements.

The tractive power was determined with a Baldwin dynagraph.

The wagon employed was the usual thimble-skein four-wheel farm wagon, with a 2-in. tire. Experiments 3, 4 and 5 were made with wheels averaging 42½ in. in diameter, and the remainder with wheels averaging 47 in. Usually the pavements were known to be level; and where they were not, a trial was made in each direction, every mean being used to eliminate grade resistance.

TRACTIVE RESISTANCE OF LEVEL PAVEMENTS.

Ref. No.	Description of pavement.	Lbs. per ton.
1.	Asphalt: Chicago—Calumet Ave., bet. 43d and 44th Sts.; clean, smooth, no cracks, 52 deg. F.	37
2.	Chicago—Calumet Ave., between 43d and 44th Sts.; clean, smooth, no cracks, 84 deg. F.	70
3.	Chicago—Washington Boulevard, bet. Halsted and Green Sts.; clean, smooth, no cracks, 42 deg. F.	34
4.	Brick: Champaign—University Ave., west of New St., 3x9 ins., brick on concrete, corners rounded, sand filler, not worn, clean	17
5.	Champaign—Second South St.; as above except newer and covered with ½-in. of dust.	31
6.	Champaign—First South St.; as No. 4, except cement filler; just completed	22
7.	Chicago—Peoria St., bet. Washington and Randolph; 2¼x8-in. brick on concrete; pitch filler; new.	24
8.	Chicago—Laurel St., stock yards, 3x8-in. brick on gravel and cinders; sand filler, corners not rounded.	37
9.	Chicago—Exchange Ave., stock yards, 2¼x8-in. brick on sand and old macadam; tar filler; new	25
10.	Granite Block: Chicago—Exchange Ave., stock yards; smoothly dressed 3x9-in. blocks of concrete, joints, ¼-in., tar filler; not worn	29
11.	Chicago—Randolph St., bet. Desplaines and Halsted; smoothly dressed, on concrete, pitch filler; new.	30
12.	Chicago—Halsted St., bet. Randolph and Washington; ordinary granite, laid in 1892	36
13.	Macadam: Chicago—Michigan Ave., bet. 42d and 43d Sts.; granite top; no dust; no mud	18
14.	Plank Road: Oak plank, 3x12-in., nearly new.	32
15.	Exactly same as above after worn down ¼-in. in many places; clean	38
16.	Substantially same as above; covered with ¼-in. fine, loose dirt	40
17.	Steel Wheelway: 8-in. 11¼-lb. channel on 2x8-in. pine, that on macadam; covered with ⅛-in. powdered stone	40
18.	Same when scraped clean with a shovel.	19
19.	Same when covered with ⅛-in. fine dust.	28
20.	Wood Block: Rectangular blocks, 3x12-in., considerably worn	36
21.	Round cedar block covered with ½-in. silica pea gravel	90
22.	Exactly same as above with ¼-in. crushed gravel.	50
23.	Round cedar block; clean: blocks slightly convex on top	53
24.	Round cedar block, 2 ins. plank, 2 ins. sand, clean; not worn	37
25.	Same as above; clean; slightly worn.	51
26.	Same as above; clean; considerably worn.	54

The table needs no explanation, but perhaps a few remarks are permissible.

1. ASPHALT.—Notice in experiments 1, 2 and 3 the effect of temperature upon the tractive power. The results are very astonishing, but seem to be in accordance with the opinion of teamsters. The driver for experiment 2 seriously objected to making the test, because "it is so hot that it will pull very hard on the asphalt." No. 2 is the mean of two trials giving practically the same results. No. 3 was checked by another experiment on another part of the same street, the result being the same to a tenth of a pound.

Experiment 2 was made at a walk (about 2½ miles per hour); and a test at a trot (about 5 or 6 miles per hour) over the same course gave 79 lbs. per ton. No. 3 was at a walk, and the same course gave 61 lb. per ton at a trot. It is recognized that the two tests are not consistent, but the only explanation suggesting itself is the difficulty of making tests at a trot.

2. BRICK.—Apparently these are the first traction tests ever made upon brick pavements. The result for No. 4 was the first made, and was so much of a surprise that the experiment was repeated at several places along the street—always with substantially the same result. The difference between Nos. 4 and 6 is surprising. Possibly part of the difference is due to the effect of traffic in smoothing the pavement. No. 4 is a year older, and also has the more travel.

3. GRANITE.—The result of No. 10 was a surprise, and therefore was carefully checked. None of the granite blocks experimented upon were much worn.

4. MACADAM.—Probably No. 13 can be regarded as the very best broken stone road.

5. STEEL WHEELWAY.—The best results for this road were unexpectedly large, and are doubtless due to the deflection of the face of the track under the wheel. It is difficult to see how the wheelway in practice can be kept cleaner than in Nos. 18 and 19. Several questions naturally occur in this connection, but the discussion thereof is referred to the advocates of the steel wheelway.

Cupid Captures a Wisconsin Brick Plant.

On April 8th Charles, Henry and Jacob Hockers, who are respectively engineer, foreman and manager of the three brick yards of their father, John Hockers, of Depere, Wis., were high contracting parties in a triple wedding. "Brick" extends congratulations and best wishes.

Silicate Bricks in Montreal.

Charles Sheppard & Sons, of Montreal, Canada, in answer to an inquiry advise us that they are interested in forming a company to manufacture "Silicate" brick under the patents of Otto Anderson, of Sweden. The patentee made a demonstration at the Sheppard plant that was so satisfactory that they decided to take up the matter seriously. It is believed that the introduction of his brick will revolutionize the industry, in Canada, at least, where the difficulties imposed by reason of the shortness of the season are many.

Silicate brick can be made all the year round in a factory; every brick is perfect. The change will mean that Sheppard & Sons will have to abandon $25,000 to $30,000 worth of machinery, but this they feel is justified by the experiments which they have made.

P. L. Youngren, the continuous kiln man of Milwaukee, Wis., is erecting another continuous kiln for Burnham Bros., of that place, on their South Side yard. As the old adage says, "the proof of the pudding is the eating of it," the inference may be drawn that Burnham Bros.' first experience with the Youngren kiln must have been agreeable to them.

Fusible Cones.

BY JOHN SALT.

(Translated from La Ceramique.)

The different methods employed to ascertain as nearly as possible the temperature of the interior of a kiln are the most interesting possible to ceramists. Among all the operations necessary for the manufacture from clay of any particular object, from the ordinary building brick to the highest grade of pottery the most delicate and the most difficult is that of the burning, especially so when you come to consider the right time to finish this burning process. It is at this moment that cones fill the title role. It would be useless indeed to make a perfect piece of pottery of good color and irreproachable shape before the burning if one has not the scientific knowledge as to the right time to finish firing off. If this knowledge is not possessed by the man in control of this part of the manufacture, even if the piece be not entirely destroyed, it is bound to be reduced considerably in market value, consequently the value of these cones is apparent. Many ceramists have adopted during the past years, the Seger cone as the standard while personally I have always been accustomed in my burning operations to the use of the Vieillard pyrometric cones. I take pleasure here in giving publicity to several experiences which I have had with these cones so that my brother clayworkers may be able to profit from them.

JOHN SALT.

Much has been said and written upon these Seger fusible cones. especially in the United States where their use seems to be more followed than with the French ceramists. Without detracting in any way from their good qualities their defects, in many forms, must not be neglected either. In the first place the use of iron in the composition of the series from 01 to 010 is inconvenient as already shown in a previous article, the iron being too easily influenced by the composition of the different gases in the kiln. Another defect is the use as flux of boracic acid which volatilizes and allows itself to be attacked and partly decomposed by the sulphuric acid vapors which are always found in greater or less degree during the process of combustion. Again the carbonate of calcium of which a part is found in the same manner to be converted into sulphate of calcium. After these changes take place these elements do not act in the regular way during the general fusion of the several products which compose the cone. It has been discovered by comparison with the pyrometer that there is a certain deviation between the points of fusion in the cone burned in the rapid fire of the small sample kiln and that which has been burned slowly in a biscuit kiln of fine porcelain of 17 ft. in diameter. I have been able to remedy this fault. A few days ago in a small kiln of 7½ ft. in diameter burning enameled wares at the moment when the pyrometer cone Vieillard marked 1, indicated 40 points, the Seger cone 04 commenced to melt. This same cone 04, burned in a large buscuit kiln fuses when the pyrometer marks 30 points. Without any doubt whatever, here is a serious fault. Without perhaps being able to explain the matter we know that the duration of burning in certain kilns, when for instance, we are burning enameled wares. may vary from 18 to 24 hours, and it is there that the point of fusion can vary and induce an error.

Another defect, and not the least to my mind, is the manner in which the cone behaves at the moment of the commencement of fusion, as a result of the way in which the cone has been placed in the interior of the kiln. It is principally on this point that my last experiments have be e. 06, although more fusible, when placed absolutely vertical will fire after cone 05 which will have commenced to lean over slightly at the moment of its introduction into the kiln. I have noticed this several times. Also since I deem that the cone is valuable notwithstanding the imperfections which I have already noticed, I have modified them with success for my personal use by disposing them after the fashion shown in the illustration, Fig. 1 will demonstrate clearly that the point of fusion will be greatly affected by this disposition of the cone. In a lump of plastic clay it is necessary to fix three or four cones firmly upon a base suspending them horizontally, the least fusible on top and the most fusible beneath. The clay which holds this in position should be dried for several hours before being introduced into the kiln. During the burning the cones will take the position as indicated in Fig. 2.

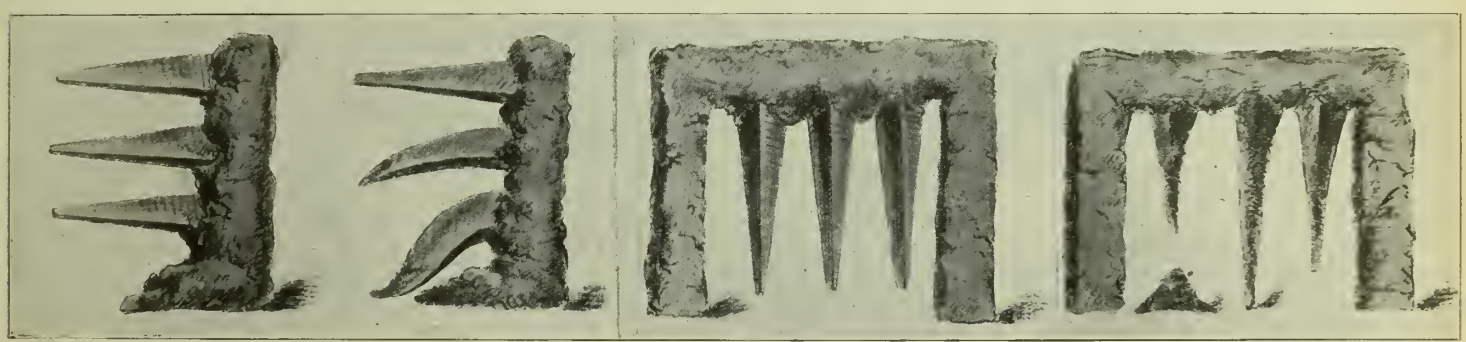


FIG. 1. FIG. 2. FIG. 3. FIG. 4.

The cone placed beneath will have collapsed vertically when that of the middle will be curving lightly, while the third will retain its primitive position if the burning is arrested before its fusion. Cones placed in this way disagree completely with the testimony presented by some cones placed in a similar bed of clay, but in the usual position.

Placed as we have already indicated, the point of fusion is changed and for an example we can say that cones, instead of fusing at 1150 degrees when placed vertically, will fuse at 1100 degrees, or at the moment of the fusion of cone 2, placed horizontally.

Fig. 3, shows another method of arrangement, the cones being suspended tips downward from a kind of clay frame and the result was extremely interesting. Fig. 4 shows in illustration what I observed during the burning, but for several reasons, I prefer the methods employed as shown in Figs. 1 and 2.

St. Louis Letter.

Business in the building line has only been fair during the last few weeks. The report of the Commissioner of Public Buildings, for the month of March, shows an increase of but 51 permits and the insignificant gain of $175,715 in building improvements for the past month, as compared with March, 1901. The report for January shows a decrease of 50 per cent, compared with January, 1901, while the February report shows a falling off of 2 per cent, as compared with February, 1901. In March, 1901, 312 permits were issued, calling for improvements amounting to $911,988. During March, 1902, in all, there were 363 permits issued authorizing new buildings, alterations and repairs to cost $1,087,703.

The March building record for the year 1896 shows that $1,295,719 was expended during that month for house construction in St. Louis. These official figures are given to dispose of the false statements of newspaper writers, utterly ignorant of the facts, and not responsible for the harm that they do St. Louis. The figures show that building interests in this city have not assumed a normal condition; that there is less doing now than at any corresponding period for more than five years past; less building going on than before the World's Fair was talked of.

Rents for dwellings are high and few houses are vacant; no town in the country is so much in need of more homes for its people as St. Louis. The World's Fair has nothing to do with these conditions unless it is that the groundless fear of overbuilding has so scared timid capitalists that they shudder at the idea of investing money in any kind of a home or hotel building enterprise. The stupendous growth of the agricultural, mining, oil, and timber interests throughout the territory tributary to St. Louis has so increased the industries and commerce of this city that it must have more for its growing population, World's Fair or no World's Fair.

Prices remain the same as last quoted, namely; merchantable brick, $7.25; ordinary brick, $7.75; strictly hard brick, $8.25; red pressed brick, $17.50; and sidewalk and paving brick, $8.50.

The brick yards are all working full time and are doing a fair amount of business, but not as much as they expected to do this month.

The strike of the brickmakers at Edwardsville, Belleville, and surrounding towns, which has been on for a week, was declared off a couple of days ago, and the men have resumed work. The only matter now in dispute is whether the present scale of wages shall apply to a nine hour or a ten hour day. This is to be arbitrated.

While sinking a deep well at Moberly, Mo., recently, one of the finest strata of fire brick clay in the state was found to be within easy reach.

The vein of fire clay is 16 ft. thick and affords an almost inexhaustible supply of the best material for fire brick. The shaft is now down 50 ft., and most of that depth has been dug through the same shale as is used to make the hardest paving brick.

The Fernholtz Brick Machinery Co.'s new building at Newstead and Old Manchester roads is completed and is all ready to be occupied, but owing to the large amount of business now being done by the company, it has been decided to postpone moving until the rush is over. This will not be likely for several weeks.

The Anthony Ittner Brick Co. of Illinois, filed evidence of incorporation, a few days ago, with a capital of $100,000, of which $50,000 is to be employed in Missouri, with an office in St. Louis. This was done for purely business reasons, and it will make no change in the firm.

The Belleville (Ill.) Brick Co. has been incorporated by John A. Day, Lina A. Day and Edward Abend. The capital stock is $60,000.

In one corner of the big shop of Smith & Eastman on the site of the World's Fair, a few days ago, the first chunk of modeling clay was thrown against the easel by Mr. William Barth, to form the first of the models to be used in decorating the World's Fair buildings. The chill of the weather made a fire necessary to the molders, and the studio was separated from the rest of the shop as well as screened from the observation of the curious by a heavy curtain of sail cloth duck.

The model was that for which the sketch had been made the day before in the down-town studio of Barth & Staak. It was a part of the decorative frieze between the pilasters of the Textile Building. It showed a cupid swinging on a garland of fruit and foliage.

The laborers in the employ of Smith and Eastman had been preparing for several days for the event. They had brought to the shops from Cheltenham a lot of modeler's clay and this had been softened and formed into cubes in preparation for the work of the modelers.

Report of the U. S. Geological Survey.

The United States Geological Survey has just issued Parts II and III of the Twenty-first Annual Report. Part II contains a discussion at length of the geology of the Rico Mountains, Colorado, by W. Cross and A. C. Spencer; a paper on the glacial sculpture of the Bighorn Mountains, by F. E. Mathers. Messrs. Turner, Knowlton and Lucas present the features of the Esmeralda formation, a fresh water lake deposit in western Nevada, with reports on the fossil plants and fish found in it.

The economic features of the report are found in papers on the mineral vein formation at Boulder Hot Springs, Montana, by W. H. Weed; the geology of the eastern Choctaw coal fields of the Indian Territory by Messrs. Taff and Adams; and a preliminary report of the Camden coal fields of Arkansas by J. A. Taff.

Four papers in the volume are devoted to the results of recent work in Alaska by A. H. Brooks, O. Rohn and F. C. Schrader. These reports are followed by a dictionary of Alaskan Geographic names.

Volume III contains an extended paper by W. H. Hobbs, the Newark system of the Pompetaug Valley, Conn., with a report on fossil wood by F. H. Knowlton; a report by T. A. Jaeger, jr., and E. Howe, on the laccoliths of the Black Hills, with a chapter on experiments illustrating intrusion and erosion.

Papers on economic geology are from C. R. Van Hise on the iron ore deposits of the Lake Superior regions and from C. W. Hayes on the Arkansas bauxite deposits, and Tennessee white phosphate.

The volume closes with a report on the geology of the Philippine Islands by G. F. Becker. In this report is collected all that is known of the geology of the islands, and also a tabulated bibliography of the literature on the subject. The report is accompanied by two maps of Spanish source of the Archipelago and is followed by a full translation of the paper by K. Martin on Tertiary fossils in the Philippines.

The Red Wing (Minn.) Sewerpipe Co. is making rapid progress in the erection of the new buildings to replace the one recently destroyed by fire. The company is also making extensive purchases of property for piling ground.

Brick in Architecture.*

BY J. MILTON DYER, CLEVELAND, OHIO.

In his most scholarly address of last year Mr. Blackall pointed out to this body "How to Reach the Architects," and I thoroughly indorse all he said.

I do not know that it is expected of me, nor that it is desirable, that I express myself as to the selection of a particular brick for the accomplishment of a given construction or color combination, and should I perchance do so, I assure you that it is not because some especially attractive briquette in form or color has found its way to my heart.

The subject of my paper, "Brick in Architecture," is necessarily a misnomer, for to tell the story of brick is to rewrite the larger part of the history of architecture. Nor should I attempt, even were I capable, to touch upon the development of that class of products known under the general term ceramics.

Those of you who have kept yourselves informed upon the development of ceramics in France and Germany and their extensive introduction into architectural construction, both in exterior and interior decoration, especially since the growth of the movement known as the "new art" movement, and have made yourselves familiar with the Paris Exposition of 1900, will recognize the enormous possibilities of ceramics.

My purpose is merely to try to point out the position burnt clay products occupy at present, touch lightly upon their past and indicate some of the possibilities of their future development, a development which is destined to be most important and far-reaching, affecting as it does the very face of our civilization, and which development is due in the largest measure to the National Brick Manufacturers' Association.

The subject that interest most in this paper are decorative resources of ordinary brick, i. e., brick in its simplest form without moldings, employed either alone in construction or in association with stone, wood, iron or other burnt clay products, and its rational employ in a conformity with structural principles.

Believing that a good story never grows old, I shall in the fewest words says something of its past.

Brick is the oldest of the artificial materials used in the building arts. Prehistoric archaeology shows the existence in Gaul, even before the bronze age, of well-developed furnaces for burning pottery. The step from pottery to burnt clay as an industrial material resulted from the abandonment of caves, huts and tents for more pretentious abodes when man came to recognize the family and society, which implies an already advanced state of civilization.

He probably made his brick of slimy clay, taken from the edge of some watercourse or of the oily clay found in the valleys. The peoples living in the fertile valleys of the Tiger and Euphrates, those in Asia Minor, Syria, Egypt, and even China, not having a good natural building material at command, learned the art of making brick twenty or thirty centuries before our epoch.

It is said the Tower of Babylon was constructed of brick. Nineveh and Babylon were built of brick, and from the ruins of the latter city were taken brick covered with enamel, as well as burnt brick from the interior walls, but sun-burnt bricks were far more general in these Oriental countries so frequently visited by the sun.

In Egypt bricks were employed in the construction of the pyramids, and it was here that brick was said to have been made, mixed with straw, this mixture being necessary to prevent crumbling upon drying.

The unburnt bricks of Babylon and of Egypt were large and heavy, and those found are remarkable for the state of preservation in which they are found after more than three thousand years and in spite of their friability. And there can still be distinguished the remains of vegetable matter introduced into them.

Certain temples in Persia were constructed of unburnt brick of very large dimensions, and the great wall of China is for the largest part constructed of burnt brick, that is to say, the interior walls are of brick and faced with stone. The same is true of the famous Pagoda of Chalembron in Hindostan. The Greeks were acquainted with brick from the earliest times, the walls of Mantinea and a part of those of Athens, as well as several temples, among which is the temple of Apollo, were built of brick, some of it hard-burnt red brick. Several of the Greek temples had marble facings, but for the most part the brick was covered with a bed of stucco.

The Romans employed brick to a great extent in their construction. They made not only walls, but pavements, in which the bricks were laid in what is known as the herring-bone pattern. The streets of Siena and several other Italian cities are paved in this same manner.

It seems certain that Rome during its first centuries was only an unformed mass of unburnt brick and mud walls. Later, however in order to economize space, laws were introduced prohibiting walls of more than a foot and a half in thickness, which forced constructors to make use of materials of more resistance, and as a result brick almost disappeared from Rome.

The Pantheon of Agrippa is the oldest Roman edifice constructed entirely of brick. Roman monuments before the reign of the emperors were built of tile rather than brick, properly speaking.

Under Gallienus walls were formed alternately of brick and soft stone courses, but after the ninth century the employment of brick, together with or in association of other materials, generally ceased.

In Spain the Moors employed brick in the construction of the walls of the Alhambra and the Mosque of Cordova.

In England the fabrication of brick was introduced in the ninth century by King Alfred, but the first important work was the palace of the Archbishop of Canterbury, at Croydon. During the last three centuries brick has been so common in England as in many places to almost completely displace stone.

In France the earliest employ of brick was to serve as a filling in, while projecting features, such as casings, cornices, etc., were of stone.

Dating from the fifteenth century usage was made of brick in civil construction. The architects of the Renaissance were very fond of them, either as panel wall spaces, for ornamenting or united with stone, as for example, in the Chateau de Blois, certain parts of Fontainebleau, and the Chateau de Madrid, near Paris, built by Francis I. of which latter the bricks are enameled.

In the north of France the use of brick as a wall space in a half timber construction gave rise to many varied and interesting designs. Over the greater part of France molded brick was employed only rarely in the middle ages, while, on the contrary, they found great favor in Italy, Belgium, Holland and Germany. Most brick constructions in Germany are of Gothic architecture.

Modern brick construction, constructively as well as from a decorative point of view, has undergone a considerable development. This may be explained by the refinement of public taste and by the incessant progress of ceramic industry.

Within the space of a very few years there has been brought about a change in the aspect of our American cities, as well as the greater part of European cities, and many monumental features have been executed, not attempted since the Roman era.

Th logical employ of brick in modern architectural composition is certainly more general in Europe than with us. They have sought to understand brick from a constructive sense and to combine it constructively with other materials, and in a degree they have been successful in expressing this construction in color.

*Read before the N. B. M. A. Convention at Cleveland, O., Feb. 12-16, 1902.

In certain instances brick forms the entire structural framework and leaves the eye in no doubt of its precise role in the construction scheme, while some other material, or a different colored brick, makes up the intervening wall space. At other times stone or iron is called upon to carry and do the work, while brick, in her rosy garb, has but to lie at ease and look handsome.

One has, however, merely to follow the Brickbuilder, which so ably champions clay products, to realize that our best architects consider your material worthy of introduction into truly monumental constructions, and the result has expressed itself in some most creditable buildings.

The English and Norman manor houses, the French chateaux and the modern beaux arts treatment are furnishing good examples and fruitful inspirations to our architects, and evidences are beginning to show of a distinct class of American country homes in brick.

In the selection of a building material, the decision rests in most cases with the architect. Each building, properly studied, presents, or should present, to the architect its own particular point of interest. In some it is an economical consideration, where the aim has been to bring the material chosen and the construction followed in complete harmony with the intended utilitarian use of the building, and the architect is judged, and properly so, after the manner in which he has accomplished these ends. In certain other architectural productions, it is the decorative qualities that decide the material and form the point of interest.

When in the choice of a material brick is permissible, there can be no question that brick, in almost all cases, presents an unquestioned economical advantage, and this consideration alone, were there no others, has made it necessary for the architect, even he who believes only in eternal stone, as exemplified in "Rock of Ages," to study brick for itself and in its combination with other materials.

But there are other considerations than the one of economy, for it has been abundantly demonstrated that it is possible to accomplish buildings of brick construction, both monumental and modest, of undisputed architectural value, and fortune awaits the architect who learns to use brick.

My friends, the architect's success means your success. With the assurance that every successful design in which brick is wisely and judiciously used adds dignity to your material and to your profession, you may well afford to be patient with the architect, who is perhaps too exigent in his insistence upon certain color and texture, and you may be sure that when you succeed in aiding him to realize his ideal, you have added a joy to his life, a friend in yours, and incidentally broadened your field.

For the most part, architects are sincere in their desire after happy results, and architecture being a creative art, the architect feels toward his production something of the affection of a mother for her child; so, again, be patient with him.

The architect often selects stone for his materials, or even wood, by reason of the great number of good examples at his command, which serve as a precedent to aid him in his designs and prevent him from going far wrong.

In using brick he must have a color sense, and more skill is required in the design of a brick building or of brick in combination. His unfamiliarity with the medium at his disposal often decides him for the material with which he is better acquainted. And in composing a brick building the architect is drawn upon for more cleverness in detail structural design. In the spacing of brick for extended, as well as limited, wall spaces, knowledge of the different bonds and of the value and direction of joints in design is required. Often when special brick are required his ignorance of the possibilities of brick causes him to hesitate where you, with your knowledge, could easily solve the problem and make the required brick. He, not being able to do so, selects another material.

The execution of projections in brick necessitates certain modifications in the construction of the courses adopted, but the principle which dominates their composition is to subordinate the decorative effect of projection to the solidity of their construction.

The small dimensions of brick form at once its charm and its limitation; its charm in giving color, texture and interest to wall spaces; its limitations in the difficulty of producing by simple methods horizontal shadows by means of projecting horizontal courses and cornices, and it is in attempting such cornices and projecting parts that brick has suffered the greatest misuse. The play of light and shade is very important, and the architect uses all the possible resources at his command to produce shadow, and so avoid the cardboard appearance to his elevation.

In reading over the report of last year's convention I got the impression (perhaps wrongly) that there was a disposition to look with disfavor upon the association in design, of brick with any other material. I thoroughly believe that with brick alone, in its most simple form, without recourse to moldings or color schemes of any sort, buildings satisfactory in every sense can be designed and built; while the brick types are fixed, an infinite variety of taste and fantasy can be introduced without effacing them.

With the introduction of moldings and color, naturally more varied designs can be produced. But I am also convinced that brick with wood, brick with stone, and brick with iron can be employed with mutual advantage, and that, constructively, one may supply the limitations of the other, and that every recognized good design in which any two of these materials are used together cannot help but be advantageous to both.

Constructively, stone supplies the projecting cornices and courses so hard to obtain by brick alone. From a constructive point of view also iron enables brick to span distances it would otherwise be unfitted for. In both cases each material should be used honestly and each find expression on elevation. To illustrate this, it has always seemed to me bad art to construct brick stretching courses over very wide spans and thereby conceal the iron lintel which supports them. The eye is not satisfied, and that the span holds up is a most perplexing puzzle to the laymen. How much better it would be to honestly show the iron beam conscientiously doing its work, make it a part of the design and at the same time set brick right in the eye of the world.

It seems to me you may well afford to give stone the opportunity to stand side by side with brick, for brick has faithfully backed up stone for many a century.

In terra cotta you have a burnt clay product that is capable of replacing stone and to a large extent perform its functions.

There can be no question of the ever increasing value of brick as a constructive as well as a decorative material, and it seems equally as sure that the burnt clay industry is coming to assume such importance and dignity as to assure its marching hand in hand with steel in the van of the world's industries.

William H. Grothe, York City, Pa., is erecting a new kiln with a capacity for 200,000 brick.

Walter S. Dickey, of Kansas City, Mo., has purchased a controlling interest in the Macomb (Ill.) Sewerage Co., and contemplates expending $25,000 for improving and enlarging the plant at Macomb.

The streets of Crawfordsville, Ind., will be paved with brick in preference to any other material, the decision having been reached after a long debate and thorough investigation into the merits of brick. Local manufacturers will supply the material and the yards at Crawfordsville will be running with a full force this season to fill the order.

The Plant Down-Draft Kiln.

There is possibly no field of industry in the United States in which there are so many combatants as that of the clayworking industry and the hottest points of conflict are around the standards of the drier and the kiln hosts. The kilns which are occupying the most attention at the present are the continuous and the down-draft kilns. To those who have given much study to the latter it would scarcely seem possible for them to be subjected to much radical alteration, but in the Plant kiln there are one or two features of construction which we think would be of interest to our wide circle of practical readers. It is impossible of course, by a mere description, to explain the exact workings of a kiln, and for this reason we have taken particular pains to reproduce drawings of the kiln so that its construction and operation may be readily comprehended by the reader.

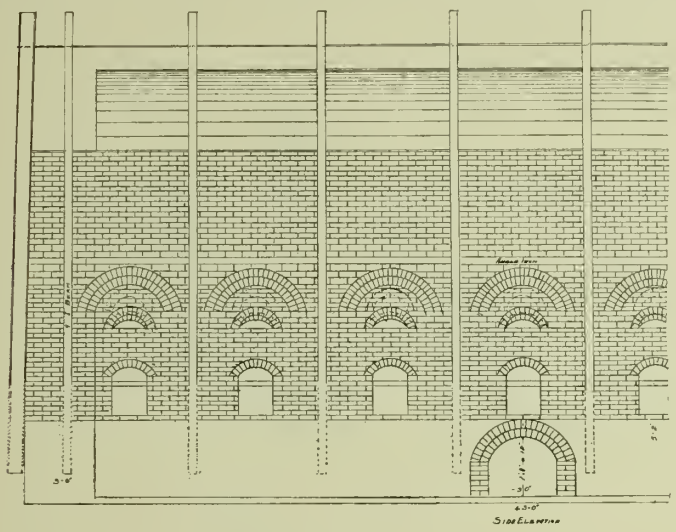


FIG. 1.

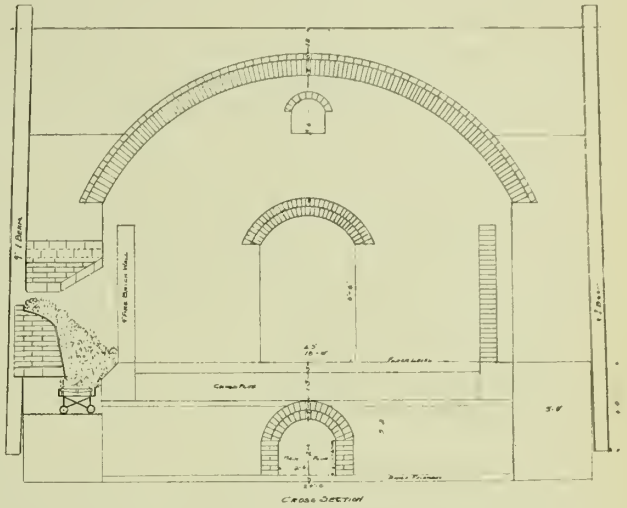
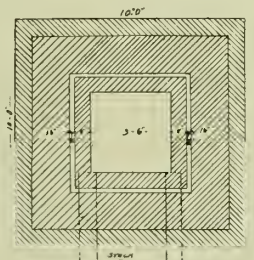


FIG. 2.

The kiln in shape is rectangular and can be built to any desired capacity, and it was originally designed to burn an extra quality of front brick. Mr. Plant has brought to this kiln the result of some 35 years' practical experience in brick manufacture, careful study and continual experiment.

In 1901 several similar kilns were built at the works of the Tiffany Enameled Pressed Brick Co. at Momence, Ill., and that company obtained very satisfactory results with dry pressed brick. As high an average as 95 and 98 per cent of clear-faced, well-burned stock brick being the product of these kilns. Many of the chief buildings in the large cities of the United States are constructed of brick burned in these kilns. It may also be mentioned that the Plant kiln has turned out some very good enameled products, some kilns being in operation in Massachusetts, New Jersey and Pennsylvania with entire satisfaction.



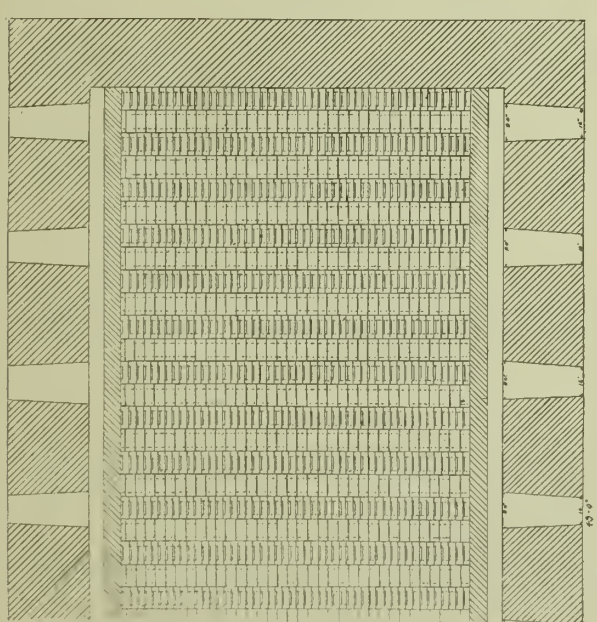


FIG. 3.

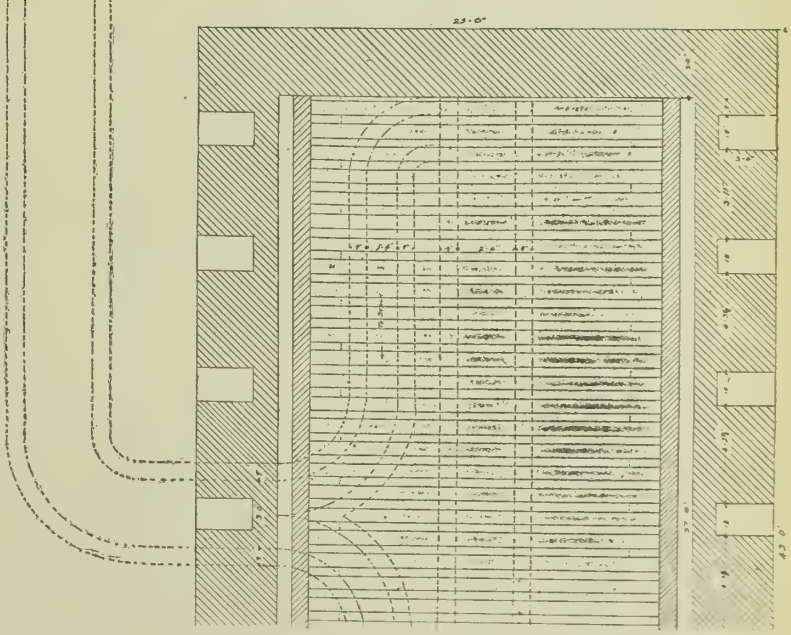


FIG. 4.

The principal features claimed for the Plant kiln are as follows: 1, The smokeless fire box which ignites the gas from the start of firing, the gas passing into the kiln as clear fire. 2—The semi-muffle heat retaining floor. 3—Lock joint construction of the crown. 4—Great strength and durability with the minimum cost of construction. 5—Ability to burn any kind of coal or slack with the best results.

Possibly one of the most interesting features of the kiln is the bottom of the floor, which is so constructed as to retain a large amount of heat which passes through the floor in the flues on its way to the stack, while a uniform feed of fire from end to end and from side to side may be regulated at will. There are no dampers in the kiln whatever.

A careful study of Fig. 1, will show the main flue under the floor. The cross flue visible is closed while the section where the main flue terminates is connected with an open flue at the opening. The fire is placed in the fire box at the side, which it will be noticed is especially adapted for rapid combustion. The gases having ignited pass up through the bag wall to the crown of the kiln and down through the products to the floor.

Fig. 2 shows the side elevation and gives an excellent idea of the outside construction of the fire box and the general strength of the kiln.

The fire box is funnel shaped. The coal is fed in front on a coking table and the gases driven off pass over the body of incandescent coal and are ignited before entering the kiln. The grate bars are about 16 in. square and can be taken out after the fires have been started, when bars are no longer necessary. In firing these boxes, the fireman uses a rake to push back the live coals and then adds two or three shovelfuls of fresh coal in front. It is reported that no difficulty is experienced in burning low grade coals or slack. The fire boxes are built within the kiln wall itself and the flame has but a short distance to travel from the fire box to the kiln.

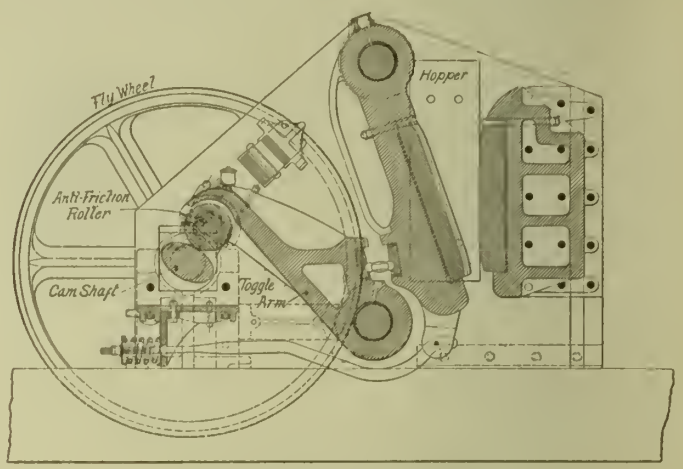
Fig. 3 reveals the ground plan of the floor. It will be observed that every alternate flue is closed. The gases, when they reach the floor, enter the "open flues" through the floor openings, are drawn along the open flue to the sides of the kiln and then enter the adjacent closed flue by opening the ends, being then drawn to the center of the kiln until they reach the main flue, which runs the whole length of the kiln. It must be kept in mind that the "open flue" has no connection whatever with the main flue except by way of the adjacent "closed flue." This main flue is tapped at each end of the kiln not in the center, hence the draft is stronger at each end of the kiln and gradually decreases in strength until it reaches the center. This is also the case with the draft at the sides of the kiln. In Fig. 4 will be observed the flues which tap the main flue as shown by the dotted outlines; on emerging from the kiln the tapping flues again become one, conveying the gases then to the stack. It is claimed that this type of flue construction does away entirely with the necessity of dampers and permits the perfect circulation of fire beneath the floor before it leaves the kiln and with the fire being thus evenly regulated it is possible to obtain a hard burned bottom brick of equal quality as those which are on the top of the kiln.

It is also claimed for the Plant kiln that any product whatever may be burned in it, such as front brick, refractory fire brick, brick of all colors such as iron spot, old gold or any of the several different colors, the finest white enameled brick, salt glazed brick and sewer pipe and tile.

The inventor, Mr. Plant, has been kept busy for some time in the erection of his kiln in the different parts of the country, and is prepared to give any further information concerning its construction and efficiency upon application.

Champion Steel Rock Crusher.

It is well recognized that the success attained by most American manufacturers is largely due to their willingness and even anxiety to adapt improved machinery, and it is not necessary to go outside of the brick business to test the truth of this proposition. The accompanying illustration shows one of the machines which has been developed within the last few years for crushing shale, fire-clay, rock and other hard materials. Brickmakers who have used the



"CHAMPION" ROCK CRUSHER.

apparatus find that it saves power, saves in the cost of sledging, of handling the material, and saves in wear and tear on the dry pan.

The steel frame is thoroughly bolted with double-nutted bolts, and as added security against bulging at joints, the frame plates are tongue and groove fitted. The stresses are all taken up by the metal, and the office of the bolts is merely to hold the parts in position. The main shaft of the crusher is elliptical in shape and thus one revolution of the fly-wheels produces two movements of the jaw, permitting slower initial speed and therefore less wear resulting from heating of bearings. All parts of the machine subject to wear, except the crushing plates and the toggles, are of steel forgings.

This machine is made in several sizes, adapted for use in large or small brick plants. The "Champion" crusher is made by the American Road Machine Co., of Kennett Square, Pa., which will be glad to mail their special catalog for brick manufacturers to any address on application.

Work has been begun on the erection of a new brick works at Addington, I. T., which will have a daily output of 25,000 brick. The company will employ 40 men.

The pottery of G. W. Arblaster, at New Bethlehem, Pa., which was destroyed by fire on February 19th last, entailing a loss of $8,000, will probably be rebuilt. Mr. Arblaster has not fully decided as to whether he will rebuild in New Bethlehem, or erect a new plant elsewhere.

The oldest brick plant in the world is believed to be that at Nivaagaard, Denmark, which celebrates its second century anniversary this year. The plant began operations in 1701 for the purpose of manufacturing brick and terra cotta to be used in building a castle for Queen Louise. The records show an output of only 350,000,000 brick in 200 years, about half of which was produced in the last 25 years.

Raneegunge Pottery Works, Raneegunge, India.

An Interesting Description of India's Greatest Clayworking Establishment.

BY "BRICK'S" INDIAN CORRESPONDENT.

India! The name evokes thousands of very wonderful memories of beautiful skies and brilliant waters, flat river banks, palm trees, mud huts, thousands of coolies working in the rice fields and huge bamboo barges floating down rivers with the swirling tide. India indeed is a land above all others in varied interests and it is larger than the whole of Europe, barring Russia, and has an immense population of over 300,000,000 inhabitants. It has every variety of climate, from a region of perpetual snows, capped by majestic Everest to the torrid lands where the ground beneath your feet is a furnace refracting waves of heat overpowering in their intensity. For the people who look upon the atlas and see that triangle of land whose southern point juts out into the Indian Ocean and who have not yet had the opportunity of visiting the country, it is hard to conceive of the lasting impression which the traveler gains by

THE POTTER AND HIS WHEEL.

personal observation and of the unutterable fascination which all things Indian have forever afterwards. Here can be found altitudes of land varying from the level of the sea to the Himalayan summits; here also are found analogous grades of civilization extending from the lowest caste of coolie to the Brahman priest, and with all these grades one finds innumerable creeds, castes, colors and planes of civilization and in religious matters the varying tribes of India differ far more in belief and bitterness than do the most widely differing sects of the Christian and other religions in Europe, as the Catholics, Protestants and the Mohammedans. And yet, with such wide divergence among the people of India, and it may be said there is no tie which binds them as a whole, India has always remained, is still, and will ever be, India. The white man is but a transitory apparition on the kaleidoscope of Indian history. The white man has gone to India for centuries, has ruled with an iron hand, has laid down laws to the natives beneath them, and compelled their obedience. Yet never once has the Indian assimilated white customs, and the character of the country and its inhabitants has remained unchanged, the white man dying and leaving his mission of government to his successors who appear and disappear in an equally transient manner.

Ever since the 16th century India has been domineered over by white races in this manner and has suffered this domineering for the simple reason that the various tribes have ever been incapable of co-operation owing to these barriers of blood, sect and social customs. The white man, by carefulness of diet and abstinence from alcoholic liquors and other bad habits, may attain a fair age in his rule, but the climate kills him at last. Sometimes the most obstinate of them will live to bring their children up in India in the hopes of their acclimatization so that their rule and influence might become hereditary and permanent, but so far history has only to report that such efforts have proved futile at the fourth generation. Nevertheless, India will always have a great charm for us and will afford a fruitful field for our investigation.

So far as the resources of India for the manufacture of clay products are concerned we may say safely that India possesses clays for the manufacture of every known product. The fire clays are found in many places in abundance. Low grade clays are used for the manufacture of bricks and again in certain provinces the finest quality of clays are in existence, suitable for the manufacture of the highest grade of pottery and earthenwares. Bricks burned almost to vitrification have been in use for a long time in Indian alluvial lands, and sun-dried unburned bricks of very large size have been used for building purposes from time immemorial and excellent specimens of them are still to be seen in the basements and walls of some of the old Jain temples at Hira Tambul, Anagherry and in the walls of mud forts at Gudduk and Dummal. These bricks vary in size somewhat but average about 2½ ft. in length, 15 in. in breadth and 7 in. or 8 in. in thickness. Originally, they formed a very solid wall, but the ravages of weather now show gaping seams between the bricks, though so tenacious are they still that it is impossible to separate them without breaking.

Every Hindoo village has its potter for clay products which are an essential need of the native. For cooking apparatus small vessels are used, and for storage purposes for grain and other commodities, very large earthenware jars are required. From an artistic point of view it cannot be said that the decorative work on these vessels has any great value, but many of the shapes are exceedingly beautiful. There is a reason for a lack of artistic incentive, however, in that no Hindoo will touch a defiled vessel of any utensil which may have been polluted by the touch of other castes, and an impure touch would thus necessitate the destruction of a work of art.

The Buddhists of Pegu and Burma have no such scruples, however, and they make the famous Martaban jars which are glazed vessels impervious to acid attack and are manufactured by thousands for domestic and export purposes.

The Mohammedans in India produce many fine specimens of encaustic tiles which are also found amongst the products of the potters in the Scinde district. The domestic vessels made by the Scinde potters are decorated chiefly with a conventional flower pattern pricked in from paper and dusted with a color. Some very fine specimens of black and white ware are also produced by the Hindoos and also of basket ware. These are ornamented with red and blue colors and by rubbing the surface of the product with gray and copper-colored mica of varying grades of fineness, a beautiful metallic effect is produced on the surface of the clay. The machinery used for the production of these wares is restricted to the time-honored potters' wheel consisting of a horizontal fly-

wheel held in a wood frame, heavily laden with clay. The wheel is 2 ft. or 3 ft. in diameter and weighs from 60 lbs. to 80 lbs. and is worked by the potter's hand, assisted by a stick. When the wheel has been skillfully set in motion it will run truly for seven or eight minutes. The clay is then placed on the wheel before which the potter squats and with dexterous fingers and unerring eye the plastic mass assumes shapes at his will. The ware is then dried and the native firing is conducted on the most primitive principles, the kiln being only a large hole in the ground in which are placed alternately layers of dry reeds, bushes and ware until the hole is filled to the top. It is a marvel indeed how any perfection is attained with such a crude process, but some of the wares are exceedingly beautiful.

It must not be imagined, however, that India is without up-to-date potteries and it is to one of these that we would take our reader. At Raneegunge, on the river Damoodah, 120 miles from Calcutta, will be found a scene of enormous activity. Raneegunge derives its name from the Rani of Bardwan. Rani is the Hindoo name for the consort of the Hindoo Rajah and this good lady had obtained proprietary rights in the district. Raneegunge has perpetuated her memory in its nomenclature. Here are to be found the largest working coal fields in India, 39 miles long and 18 miles wide, giving employment to thousands of native coal miners. It is a non-coking bituminous coal, as all Indian coals are, and sells for from $5 to $6 per ton.

One of the chief attractions of Raneegunge are the potteries of Messrs. Burns & Co. These are situated almost opposite the main entrance of the railway station, and the visitor is entertained most courteously by the superintendent and the officers under him, who make a specialty of gratifying the desires of the sightseer. Immediately on leaving the office the visitor is confronted by an immense pyramidal structure resembling an Aztec teocalli. This, he will be informed, was the first kiln erected by Mr. Macdonald, and it is known to the hands as "Miss Macdonald." It cost quite a fortune, over 33,000 rupees. If you inquire who Mr. Macdonald was you will learn that Mr. George Macdonald was a Scottish potter who, in 1866, visited that part of India and noted with a keen eye the

DOLPHIN FOUNTAIN.
Diameter, 10 ft.; height, 6 ft.

many natural advantages possessed by Raneegunge in the shape of clays and minerals, not excepting that important item to the clayworker, coal. Previous to this, Mr. Macdonald, who was a son of a Caithness minister, had practiced as a civil engineer in Calcutta for many years, returning home to his native country with a comfortable competence, but the seaweed-saturated atmosphere of bonny Scotland had lost its charms for the Scot, and like the soldier in Kipling's poem, who declared

"If you've 'eard the East a-callin'
You won't never, 'eed naught else,"

his heart wanted to be back among the palms and the cocoanut trees of India, and he planned the erection of a pottery at Raneegunge. In this venture he sunk all he had, and, like so many other pioneers who failed in their endeavor, only to leave a platform for the success of another, the enterprising Scot in four short

A STUDY IN SEWER PIPE EVOLUTION.

years of time, found himself in difficulties and his works were sold above his head. He then accepted the appointment of superintendent of iron works at Nahun, in the territory of His Highness the Maharajah of Sirmoor, in whose service he died from psoas-abscess. His remains were interred on the spot far from European habitation, among the eternal hills of India. The Rajah of Sirmoor, to prove how much he felt the loss sustained, caused the immense works to stop and all business to be suspended in his capital for some days.

Macdonald's pluck was superior to his luck. On his retirement from Raneegunge Messrs. Burn & Co. stepped into the vacant place and for a few years it seemed as though his fate was to be their own. The fault did not lie with them, as they were able to place upon the market, ware of every description of first rate quality. They had to encounter that giant of opposition, the deep-rooted prejudice against country-made ceramics. Neither the government nor the engineers would have anything to do with their products, but fortunately they were in a position financially which enabled them to wait patiently until the merit of their products would win for them the place which could not be ignored even by the British Government. After a dozen years they reaped their reward, and now there is no one in the Orient whose products are more widely known and stand higher in quality and variety.

But, as the French say, "revenons à nos moutons"; we were observing just now Miss Macdonald. On each side of this huge kiln which is still in successful operation, are long lines of kilns of more modern pattern. Many of them are of the "muffle" type, which are exclusively employed to take the finer classes of ware. Forty kilns are used for the immortalization of the Burn products. To the right of these stands one of the engine houses where an ever-active 80 h. p. engine, fed by two large boilers, contributes a portion of the power required for the manufacture, the remainder being supplied by two larger sets of engines aggregating 200 h. p. and fed by a battery of five other boilers. All these are specimens of the very best work of Messrs. Burn & Co's. yards at Howrah.

close to Calcutta. Howrah has left one green spot in my memory forever, a refreshing oasis on a blistering hot day, a delightful bath-house buried beneath the thick foliage of protecting trees, with a visitor's register-book, overflowing with dubious nomenclature and blasphemous language, and with waters deep and ice-cold, overhung by trapeze, ropes and springboard.

The clay is procured from districts close at hand, and within a radius of 20 miles there are no less than nine varieties of clay suitable for every kind of clay product made at the present time. Every part of the yard is covered with railway and tram lines for conveying the raw material and the finished products, and the taking of the green and burned goods to and from the kilns.

FINE SPECIMENS OF RANEEGUNGE ART.

The buildings of the plant number a score or more of different shapes and sizes. Some of them have an area of hundreds of square feet and have noble arched roofs; others, of course, are of less ambitious character. A huge reservoir covering ten biggahs, or close on four acres, is the source of water supply.

We will visit first the drain pipe sheds, for our guide tells us with especial emphasis "We're death on drain pipes." The words "drain pipe" do not arouse in the human breast any peculiar feelings or emotion, but a close inspection of the manufacture of these articles at Raneegunge is full of fascinating interest. Under the spacious shed we find a gang of perspiring coolies, each busy in contributing his mite to the operations of two steam pipe-making machines. Four kinds of clay in varying proportions are placed in the grinding pan. When ground to the fineness of flour the mixture is passed through a sieve and then puddled. This accomplished, the material is put through three pugmills, one vertical and two horizontal, and after a thorough pugging, the clay is projected through a die in a column the shape and thickness of two ordinary bricks. Now it is ready for the pipe machine, and being placed in the receiver, a ram with a pressure of something like 30 tons forces the clay through a die proportioned to the diameter of the pipe required. When the proper length has been expressed, the pipe is cut through with a thin wire. It is then tipped into a cradle and carried to the drying shed—a vast corrugated-iron structure capable of accommodating some thousands of green pipes. In this shed a uniform temperature is maintained. Here the finishing process is undergone and any excrescences and other superficial flaws are removed, and then it is allowed to dry, a process occupying from seven to fourteen days, according to the season of the year. When dry the pipes are taken to the kilns to be fired, and it was a source of surprise to me to observe these Indian women, each carrying an immense pipe on her head, pipes which took three strong men to place there and to remove them when they had arrived at the kiln. All American clayworkers may understand my surprise when they learn that the pipes weigh a little over 200 lb. each. Certainly our Aryan sisters should not be classed among those of the weaker sex. This reminds me very forcibly of that little French fable of the man that used to carry a calf home every day and every day as the calf grew bigger, he still carried it, never noticing the increase of weight until calfhood was passed and he found himself carrying a bull. It is only an example of what can be achieved by practice.

In the kiln the pipe is red and glazed, the burning occupies generally ten days and the glazing is effected by coal tar and common salt. On removal from the kiln several samples of the batch are taken and tested by being subjected to a pressure of 50 lb. per sq. in., but this is far below their actual capacity, as may be noticed from the following return of the Government crushing and bursting tests of these products.

These tests were made in the presence of a committee convened by the Government of India. The internal pressures were got by hydraulic pumps; external pressures by levers and weights. Some of the results are:

INTERNAL PRESSURE.

Maker.	Internal Diameter, In.	Breaking Pressure, Lb. per sq. In.
Burn & Co., Jubbulpore	12	160
English pipe	12	90
Burn & Co., Raneegunge	12	136
Burn & Co., Jubbulpore clay	9	140
English pipe	9	92
Burn & Co., Raneegunge	9	200*
Burn & Co., Raneegunge	6	200*
Burn & Co., Raneegunge	4	200*
Burn & Co., Raneegunge	15	105

*Did not burst.

EXTERNAL PRESSURES.

Maker.	Internal Diameter, In.	Total Pressure. Lb.
Burn & Co., Raneegunge	15	4,794
Burn & Co., Jubbulpore clay	15	5,039
English pipe	12	3,216
Burn & Co., Raneegunge	12	3,646

From this it will be seen that Messrs. Burn & Co. have satisfactorily demonstrated that the Indian-made pipe is not only equal but even superior to its English congener. Every week at Raneegunge alone the firm turns out over six miles of pipes of all sizes, from the household 3-incher to the mammoth pipe for "main" purposes,

CREATIONS OF HINDOO HANDS AND ENGLISH BRAINS.

with an internal diameter of 24 in. and weighing 200 lb., to the length of 2 ft. The demand for these pipes often exceeds the supply, and it is not surprising when we consider that in addition to being impervious, non-corrosive and imperishable, are much cheaper than those made of cast iron. A mile of the clay products 6 in. in diameter costs Rs. 2,640, as compared with Rs. 9,670, the cost of iron pipe of the same diameter. Two smaller sheds close to are devoted to the manufacture of sanitary appliances—among which may be cited latrines for the native dwellings and filters,

A. WHYTE,
General Manager for Burns & Co.

which are common parts of every Indian railway station, as well as the small filters for offices, schools and private houses.

Nor, must we forget the fireclay goods, and the first thing to strike the eye was a series of products especially got up for your friend the tea-planter. These consist of small drying tunnels for drying the leaves. They are made in sets, the pieces fitting neatly together and are of special interest to the lover of "The cup that cheers but never inebriates." Besides these there are thousands of firebricks for mill use, collieries, iron and gas works.

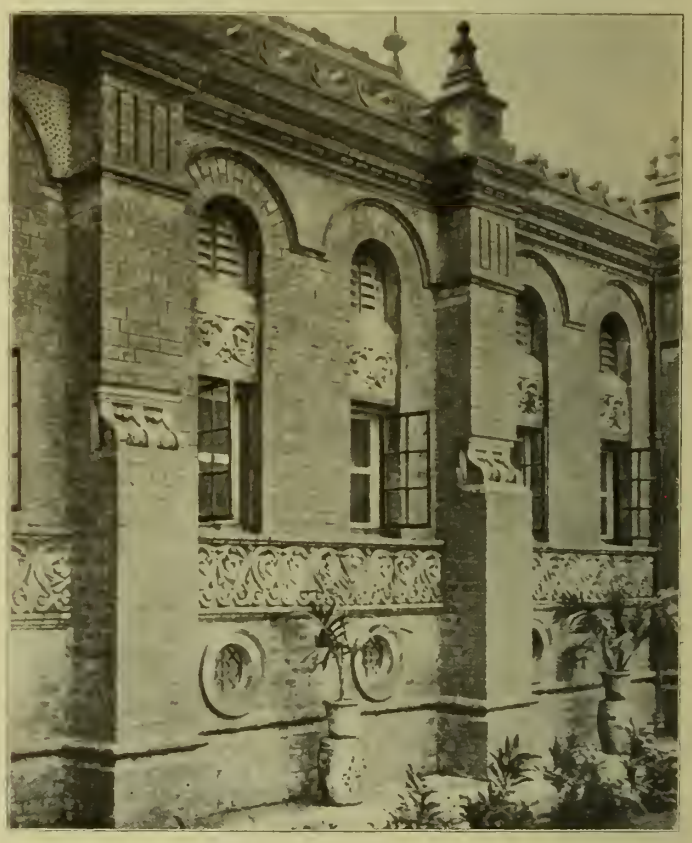
Leaving this, we immediately enter another roomy shed where two massive brickmaking machines, having an output of 30,000 a day are turning out bricks by the mile—not only the common bricks for the building purposes, but those intended for glazed bricks for bath-rooms and the blue-checkered damp-proof bricks for stairs and go-downs. We were shown with especial pride the hollow roof tiles made by the company which are so constructed as to span from girder to girder a distance of four to five feet, affording a flat instead of a curved face for the ceiling, while the hollow portion of the tile is large enough to admit a quantity of air to insure a cool roof. The roofing and flooring tiles are produced on neat hand-screw presses and many thousand are made daily.

The manufacture of tesselated tiles is another special product of the Burns company. The machine responsible for its production is a powerful die-stamp mounted upon a strong table. Underneath the die there is a hollow in the table which receives a mold; this it filled with a dry powdered clay. The natives give the wheel a vigorous turn and behold, a tile ready for the kiln. These can be made to any pattern desired and there is a large demand for them in India for verandahs and bath-room floors.

Yet another department attracts our attention, namely: the terra cotta department. Here all kinds of moldings are stamped from iron molds and the large pieces are produced by hand from plaster molds. Special terra cotta pieces are being made for wine cellars and being porous they are admirably suited for the purposes of this climate. In outer form they are hexagonal and are made to hold any size of bottle so that they have to only pile one on top of the other to form a convenient place for storing wines. A little water thrown over the tubes has a refrigerating effect. In this department I did not fail to recognize the source of the magnificent decorative pieces which embellish the government buildings in Calcutta and other prominent cities in Bengal. Around you on every hand can be seen cupolas, vases, capitols, cornices, scrollings, linings and beadings.

Finally I was shown that department which is reserved always last for the astonishment of the visitor. In a two-story building facing the entrance great numbers of semi-nude operatives are occupied with almost every conceivable class of indoor ceramics. Here is a man making a tea pot; there, engaged on an ornate mural panel on which is depicted a grotesque Hindu divinity; now we jostle against a man making a surahi or water bottle, while his next door neighbor is busily engaged building a beer jug. The drawing offices form an interesting department, and in which several native designers are at work, and beside them a dozen or more Bengali lads ranging from 11 to 14 years of age who, under the superintendence of the head designer are being initiated into the mysteries of model and free hand. Many are the models of Hindoo deities which naturally enough, are of especially skillful execution, mostly in bas-relief.

The number of employes in this plant exceed 1,400, and a quarter of this total is composed of women to whom a major part of the



SERPENT HOUSE AT ZOOLOGICAL GARDENS, ALIPORE.
An enduring monument to the excellence of the Burns products.

porterage is intrusted. The natives seem to be thoroughly contented, for no distinction whatever is made as to caste of the employe, and there is a noticeable absence of skulking, and the general cheerfulness gave me the impression that the business relations of this company are exceedingly pleasant. Work is carried on during eight hours of the day, and on Saturday everything is abandoned by two o'clock. Although there is no Employers' Lia-

bility Act in force, the meanest coolie on the plant knows that in the event of an injury he is sure of sufficient compensation, or should he become a victim of any fatality, which is exceedingly rare, his family will be liberally pensioned.

In all this article I have as yet said not one word about the law-giver of the establishment. Here we see coolies going and coming, ears switching, locomotives puffing, wheels turning and thousands of objects in process of manufacture at every stage, but at whose bidding are all these things done? Coming down the main way through the long row of kilns is a man dressed in white, before whom the coolies' usual "Salaam, sahib" is changed to a fervent and admiring "Grande Salaam, sahib!" It is Mr. A. Whyte, the manager of the works here and at Jubbulpore, the other center of the industry of Burns & Co. Jubbulpore is situated from Raneegunge about 700 miles away. Since 1875 Mr. Whyte has had

STRIKINGLY FAITHFUL REPRODUCTION IN CLAY OF THE LATE QUEEN VICTORIA AND THE PRESENT KING EDWARD VII.

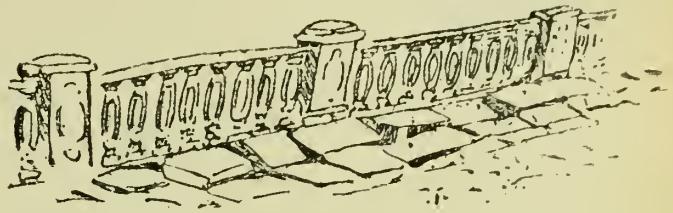
these works under his care and to his ability and good judgment much of the success of the company is due. We present him to our readers with the assurance that in the face will be recognized those chief characteristics of the clayworkers' success—self-confidence, dogged perseverance and eternal vigilance, which in the art of clay-working are as necessary as in the attainment and maintenance of liberty. Some of the products of the firm are also shown here, and their beauty will at once be recognized by every lover of fine wares.

As I left the pottery on my way back to the hotel, I obtained a general view of the works whose size had so much impressed me. Behind and on every side were the tall chimney stacks of the collieries, the many kiln stacks spell out the names of the products they contain in curling wreaths of smoke across the sky. Hundreds of men and women are hurrying to and fro, each an atom in a universe of industry, while trollies of pipes and bricks and hackeries conveying clay, stone and coal pass between the kilns and the railway station. The whole is a panorama never to be forgotten, and if any of our clayworking brethren in some years to come, traveling in his own private air ship, should happen to pay a visit to this cradle of present civilization, even if he sees nothing else, he will do well to pay a visit to the Raneegunge pottery.

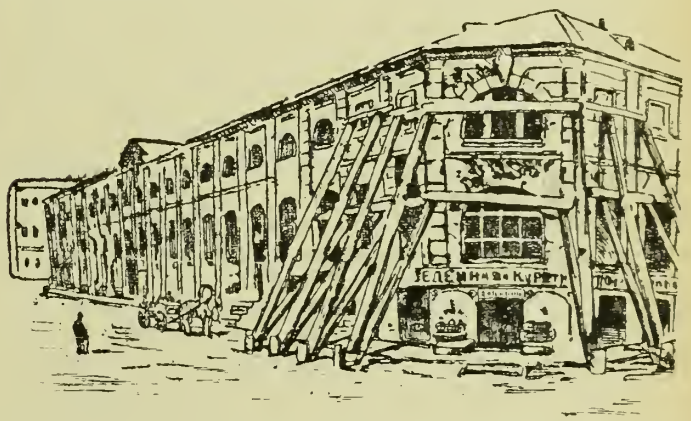
An entire trainload of 25 cars of Monmouth, Ill., sewer pipe was recently shipped to Peoria to fill a single order.

An Old Building in St. Petersburg.

The accompanying sketch illustrates some beautiful features of a worthy old veteran—the Building of the Litoffski Market in St. Petersburg. It shows the front elevation view of the most striking corner of the building in its present decayed condition. The smaller view is of a piece of sidewalk close to the water edge, on the quay of the "Krioukoff-canal," in front of the building. The heavy and



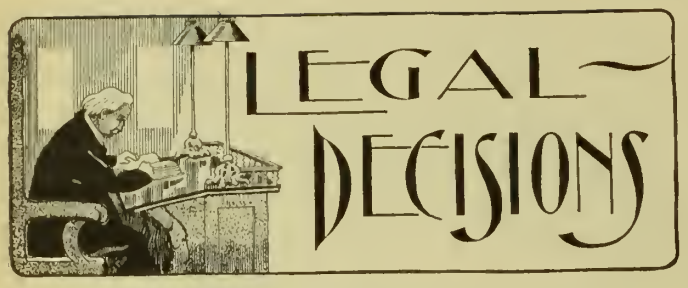
weak brick walls having, in the upper part of the building, a considerable inclination towards the street, are supported by big and thick log-props which, while not making a beautiful adornment of the mighty edifice, are serving as a most reliable means for lessening the dreadful menace of a crushing catastrophe to come. The most remarkable feature of the entire building as a whole is that it stands opposite the opera-house—the recently renewed and now fine looking Mary Theatre, across the dirty waters of the "Krioukoff-canal." The half-empty ruin, partly occupied by butchers' shops, partly inhabited by flesh-mongers and poultry-dealers, ought to have been done away with long ago, for its deplorable condition does not admit of anything but complete demolition, and yet it is being sustained for want of pecuniary facilities of our municipal



treasury, or lack of ability on the part of our city rulers, who seem to have forgotten that no building of that kind can make a monumental adornment of the capital city of the Russian Empire and of the Czar's residence. A Russian Reader.

The Bradshaw Pottery Co., of Niles, O., will soon begin the erection of two additional kilns for decorating purposes.

The Arcadia (Ind) Brick Works, which has a present capacity of 35,000 brick per day, will be enlarged by the erection of an additional plant of 40,000 capacity, which is to be in operation by next June, increasing the company's daily output to 75,000 brick. The new plant will cover an area of several acres, and it is proposed to build an electric tramway to haul the clay from the mines to the plant. The officers of the company are: Byron P. Hollett, president; John E. Hollett, secretary, and Clifton G. White, treasurer.



NOT ENTITLED TO BENEFIT OF BOND.

In the case of the Salmen Brick & Lumber Company against Le Sassier, 31 Southern Reporter 7, the supreme court of Louisiana holds that a bond given by a contractor to the owner to secure the carrying out of a building contract, and which merely recites the obligations of the bond to such owner are to become void, does not bind the surety for the obligations of the contractor, under the building contract, to laborers and material men, and the latter have no right of action against such surety.

DISTINCTIONS AS TO NATURE OF GUARANTY FOR BRICK.

A party wrote the following letter to a firm: "Mr. S., who is building a number of houses on ground I leased him, tells me you have agreed to furnish him 100,000 brick, delivered, at $6.25, on the following terms: The first 50,000 to be paid for as soon as delivered, the other to be paid for four months after the completion; and you can furnish Mr. S. on these terms, and if he does not pay you I will." The question was raised, in an action on the guaranty, whether it was to be regarded as an original undertaking by the guarantor upon the faith of which the bricks were sold to S. by the firm, or was to be taken as a collateral guaranty of the performance by S. of a contract to purchase and pay for the bricks, which had already been closed between the firm and him when the guaranty was given.

In either event, the court of appeals of Maryland says (Donnelly vs. Newbold, 50 Atlantic Reporter 513), the guaranty would rest upon a sufficient consideration, for in the first case it would have formed the inducement which led the firm to make the sale; and even in the second case, the fact, which appeared on the face of the guaranty, that the guarantor was interested in the land which was to be improved by the use of the bricks, constituted a consideration sufficient to support the guaranty. The practical difference for the purposes of the case was that, if the undertaking of the guarantor was to be considered as an original one, the firm were under no obligation to give him notice of the default of S. in not paying for the last 50,000 bricks. If, on the other hand, the guarantor's agreement was collateral to S.'s previously made contract for the purchase of the bricks, and was to become binding upon condition that the latter failed to perform his contract, then the guarantor was entitled to notice within a reasonable time of the default of S.; and, if he did not receive such notice either from the firm or from other sources, he would be released from obligation under his guaranty to the extent of any loss suffered by him by reason of the failure to receive the notice.

The language employed in the letter, the court says, was somewhat equivocal, and did not of itself clearly determine what was intended to be its character. Its opening expressions suggested an existing agreement on the part of the firm to sell the brick to S., to which guaranty was to be collateral; but the closing statement, "You can furnish Mr. S. on these terms, and if he does not pay you I will," was strongly indicative of a knowledge on the part of the guarantor that his undertaking was to constitute the inducement which would lead the firm to part with the possession of the bricks. Under these circumstances, the agreement must be given such a construction as would carry out the intention of the parties to the transaction of which it formed a part. However, it could not be said as a matter of law either that the guaranty was an original undertaking, or that it was a collateral one. The instruction of the trial judge to the jury should have been predicated upon the finding by the jury, or by the court as a matter of fact, upon whose credit the bricks mentioned in the guaranty were sold and delivered by the firm; and he should have ruled that, if it was found that they were sold and delivered in reliance upon the guaranty and the credit of the guarantor as such, his undertaking was to be treated as an original one but, if the sale and delivery had been upon the credit of S., the purchaser, then it was merely a collateral guaranty.

RIGHTS OF EMPLOYE DIRECTED TO DO DANGEROUS WORK.

An employe assisting in renovating an eight-story building where there was an elevator having two platforms which were so adjusted that as one ascended the other descended was directed by the foreman to repair it. He directed him, when the elevator was in condition for operation, to notify him (the foreman), also to notify the engineer, and the subforeman, so that the latter might proceed with lowering material, which was suspended during the repairs. But the subforeman, without having been notified by this employe or by the foreman to do so, ordered a barrow loaded with brick put on one of the platforms before the repairs were completed, and the employe was injured by the overturning of the load from the sudden starting of the elevator, which was to carry him to another floor to continue his repairs. There was nothing in the evidence to show that the employe should or might, by the exercise of reasonable care, have anticipated that the subforeman would direct the work of lowering brick to be proceeded with until he was notified by the employe or the foreman to do so, and the supreme court of Illinois affirms a judgment for $4,800 in his favor, against his employers (Wells vs. Bourdages, 61 Northeastern Reporter 1010). It says that here the employe, who was employed as an ordinary laborer, was directed by the foreman to do a special and somewhat hazardous work, with the understanding that he should notify the foreman, the engineer, and subforeman when this work was completed and they could proceed with the use of the elevator. While pursuing such work he had a right to assume that the instructions of the foreman would be observed by those under him, and that he would not be exposed to unnecessary peril while so engaged. And the court says that it has held that where a servant, in obedience to a command from one having authority, is performing an act the performance of which is attended with a degree of danger, it is not required that the servant shall balance the degree of danger and decide with absolute certainty whether he must refrain from it; and his knowledge of the attendant danger will not defeat his right of recovery, if in obeying the command of the master he acted with that degree of prudence that an ordinarily prudent man would have used under the circumstances.

WHERE MATERIAL IS NOT INCORPORATED INTO BUILDING.

A written contract for the erection of a brick building provided that certain contractors should erect it on a certain lot for the owner thereof for a fixed sum, payable in installments on estimates and certificates of the architects as the work progressed. The supreme court of appeals of West Virginia holds (McConnell

vs. Hewes, 40 Southeastern Reporter 436) that the estimates must be on the labor and material actually used in the building, and could not be extended to include material not so used, although in course of preparation for such use. The architects could only be required to make estimates and the owner to make payments on the building as it was constructed.

The material furnished by the contractors, although the owner of the building might have a conditional interest therein, remained the property and at the risk of the contractors until it had been incorporated into the building, and had been approved by the architects. If such contractors were compelled, by reason of their own insolvency, to abandon their contract, they could not sue for the work and labor performed, unless they alleged and proved that either the owner, as a dependent condition to the continuance of the work, failed to pay the estimates of the architects when properly made, or collusively induced such architects in bad faith to make such estimates for the purpose of evading the payment thereof and defeating such precedent condition. Personal insolvency on the part of the contractors did not relieve them from the obligations of their contract, nor legally justify their abandonment thereof.

A material man who furnished material to the contractors could have no lien on such building if such material was not incorporated therein by reason of the default of the contractors. Material men who furnished material to such contractors did so at their own risk, unless such material was incorporated into the building for which it was furnished, or they notified the owner of such building in advance that they would look to him for payment therefor, and he acquiesced therein, and received the material with such condition attached. In the latter case he, and not the contractors, became the purchaser of the material.

Clayworking Representation at St. Louis.

The department of Mines and Metallurgy of the World's Fair, St. Louis, has issued its circular No. 1 setting forth the scope of the exposition and the fact that greater prominence will be given the department of Mines and Metallurgy at this exposition than has ever been done at any previous one. The palace of Mines and Metallurgy will be much larger than any previous structure devoted to this interesting department and its arrangement will be very much more elaborate. On the walls will be pictured the world's mineral products and on its floor will be grouped the materials which illustrate the world's mineral wealth. We note with pleasure that considerable space will be devoted to the materials in which we are particularly interested and under the head of "Clays" Class 689 in group 116 is included molding sands, Class 690 comprises clays, kaolin, flint, feldspar and other substances used in the manufacture of earthenware, brick, terra cotta, glass and similar products. Class 691 embraces refractory rocks, fire clays and sands while another class not devoid of interest to the clayworker will be found under No. 699 in the mineral fuels such as peat, lignite, bituminous coal, anthracite, coal dust, compressed coal, raw petroleum, and its products and natural gases.

Under the name of metallurgy, group 119, class 704 will be found the equipment for, method and products of the manufacture of refractory materials for metallurgical purposes such as fire bricks, blocks, crucibles, etc.

We print below some extracts from the rules of the exposition governing the reception of exhibits which will prove of interest to all intending exhibitors. We trust that many of the clayworkers of the state will make up their minds to submit some exhibit of their products so that we may make a grand aggregate showing.

The exposition will be opened Apr. 30, 1903, and will be closed not later than Dec. 1st of that year.

No charge will be made for space allotted for exhibits.

Exhibitors of manufactured articles must be the manufacturers or producers thereof.

Allotment of space to exhibitors from countries where governments have appointed official representatives to the exposition, will be made by or through such representatives.

While it is expected, as far as possible, to confine negotiations in the United States to the official representatives of the respective states, territories and districts, the right is reserved to confer directly with individuals.

Applications for space for exhibits in the buildings of the exposition must be filed on or before the respective dates following, to-wit:

(a) For machinery and mechanical appliances intended for exhibition in operation, Oct. 1, 1902.

(b) For machinery and mechanical appliances not intended for exhibition in operation, Nov. 1, 1902.

(d) For special concessions to individuals, associations or corporations, Dec. 1, 1902.

All applications for space must be in writing, addressed to the president of the exposition, and should be presented on forms which will be furnished by the Exposition company.

All communications relating to the Exposition should be addressed to the President of the Louisiana Purchase Exposition Co., St. Louis, U. S. A.

The installation of heavy articles, requiring foundation, may, by special agreement with the Director of Works, begin as soon as the progress of the construction of the buildings will permit.

All articles which shall be imported from foreign countries for the sole purpose of exhibition at said Exposition, upon which there shall be a tariff, or customs duty, will be admitted free of payment of duty, customs fees or charges, under such regulations as the Secretary of the Treasury shall prescribe under an act of Congress providing for the Exposition.

The system of awards will be competitive. The merit of exhibits as determined by the Jury of Awards will be manifested by the issuance of diplomas, which will be divided into four (4) classes: a grand prize, a gold medal, a silver medal, and a bronze medal.

Copies of the rules, blanks for space-applications, and additional information will be furnished on request.

Interesting Description of Coal Fields.

The United States Geological Survey issues from time to time most interesting extracts from its annual report which is now in press. During the past month valuable data have been presented on the Eastern Interior, Rock Mountain, Western Interior, Elk Horn, Ohio and Appalachian coal fields. We gather from a perusal of this matter that Illinois ranks next to Pennsylvania, and is second in the list of the coal-producing states of the country, that it contains more than three-fourths of the entire area of the Eastern Interior coal fields. The chief difficulty with Illinois coal seems to be that the purest coals are of the splint or non-coking variety and that the coking coals run too high in sulphur, while they cannot be said to be very satisfactory for the manufacture of gas in comparison with other coals. The first mention of coal found in this country was made by Father Hennepin who first noticed it near Fort Creve Coeur on the Illinois River in 1698. In 1900 Illinois produced 25,750,000 tons of coal as compared with 6,500,000 tons in Indiana, and 3,000,000 tons in Kentucky. Of this aggregate amount 31 per cent was consumed as railroad fuel and 22 per cent as domestic fuel. The coal product of Illinois was transported over 33 roads of which 15 carried over 500,000 tons each.

Power and Its Economical Transmission.

BY HENRY SOUTHER, M. E., OF HARTFORD, CONN.

PART II.

(Continued from page 166, Vol. XVI, No. 3.)

BEARINGS AND LUBRICANTS.

This branch of the subject might well occupy an entire evening. On lubricants, so inseparable from the bearing, much has been written, but, notwithstanding that, the manufacturer as a rule knows but little of the subject and the oil salesman takes advantage of his lack of knowledge to surround the whole matter with mystery. The thing is simple, and I will speak of it from the standpoint of an expert.

I began my investigations on this subject while with the Pennsylvania Steel Co. in Harrisburg, which employed a great many engines, heavy and light. The task was assigned me to cut down the oil bill. Away back in '90 and '91 the oil bill was a very heavy factor. We did not know then as much about mineral oils as we do to-day; in fact, we used lard oil for lubricating, and this was thought in many cases necessary. I made a careful study of the subject, and what I am going to say is based on the knowledge and experience gained then and since then relating to all classes of machinery.

I would say, then, first break away from anything but mineral oil for ordinary lubrication. This includes shafting and all other bearings, engine cylinders and other engine parts. For cutting tools indeed you will find the good old lard oil or some emulsion best. You can hardly get away from it. But for the other purposes specified mineral oil is the best. The most important reason for this, perhaps is the fact that it does not change under atmospheric influence, it does not gum, nor become acid and attack the engine cylinder or tools. It lubricates perfectly and it is cheap. Moreover, all grades of it may be obtained, so that any want may be filled. There is no use you can think of where good mineral oil may not be found to fill the bill. As a matter of fact, there is no argument against its use. With a thin mineral oil I have loosened a "loose" pulley that was hopelessly gummed tight, with the same mineral oil I have made an engine main shaft bearing run cool with a quart a day that had run hot before with a box of Albany grease on it and a gallon a day of an animal-compounded machine oil. Illustrations might be multiplied endlessly. Mineral oil does not deteriorate from repeated use. After cleansing by settling slowly or filtering (I prefer the former method), it may be used again and again, and remains as good as ever. With animal oil it is different. In use the air oxidizes it; it becomes somewhat gummy, changes color, and turns acid through natural decomposition. It must be used a second time as a second-class lubricant on shafting, perhaps, as that is of no particular importance, you know. There it continues the good work of gumming and trying to stop the engine. Get rid of animal oil entirely, and many of your lubricating troubles will cease. Watch the market on oil and the mineral bases and buy accordingly. Do not let any oil agent work off on you any special blends or mixtures at fancy prices, for they are useless for lubrication. Do the mixing yourself, if you must have a mixed oil, and you will save money nine times out of ten.

I know a good many firms who are using animal oils for cutting tools, adulterated by 20 to 25 per cent mineral oil, and they think it works well, but if you buy that same mixture from an oil agent he will charge for the mixing, and if he does not charge more than the actual mixing price, you are lucky. If you do buy lard oil for anything, have it tested for adulteration. Nothing in trade to-day is more often adulterated. The middlemen who do the adulterating, as a rule, if they are cornered, say they do it because people like it that way. Cotton seed and mineral are both used for this purpose. Cotton seed is distinctly bad, and mineral is cheap. Cotton seed is a seam-drying oil, like linseed, and will therefore gum very rapidly. Lard oil offered below market prices is adulterated unless the case is one of pure philanthropy on the part of the salesman. All animal oils, with one or two exceptions, thicken greatly with a decrease in temperature, which means an increase in friction. The principal fault of animal oil as a lubricant is, first and last its inherent quality of changing chemically under ordinary atmospheric conditions with results that I have outlined. By the use of mineral oils the lubricant bill for a mill may be much reduced. One engine plant with which I am well acquainted generating 200 horse power uses less than a barrel a year. All of the oil used is caught after doing its work by suitably-placed drip pans. These pans all drain to a tall receptacle under the engine, from which the oil is drawn and used again, with a trifling loss. This scheme alone resulted in a saving of about $150 a year over their old practice, not a large amount to be sure, but neither was the opportunity large. One little point I want to call to your attention, viz., the manner of storing or keeping oil. Animal oils stored in metal tanks will not keep because of the acids formed. The acids form salts with the metal of the tank and in some cases have caused rapid wear or heating of journals. With mineral oil any reservoir will serve without giving trouble.

Take an example a little apart from shop practices. Railway car journals are exceedingly difficult to lubricate successfully. They are now run practically in a bath of oil and do well as compared with older practices, but hot boxes are still a fruitful source of delay and accident. Some years ago, when low-grade animal oils were in common use for car journals, the experiment was tried of using the best sperm oil. It was found possible to haul 10 per cent more cars, resulting in a saving of double the cost of the oil. In mills full of light machinery a saving of 15 per cent to 20 per cent has been made by changing oils, that is, 75 to 100 h. p. out of a total of 500. The best oil is the cheapest in the end, but please bear in mind that the most expensive is not always the best. For each class of work there is a lubricant most suited to do that work. It may be the best and cost but 10 cents per gallon. In large mills a horse power costs nearly $50, in small mills or workshops $100, or perhaps $150. It is a very easy matter to save 5 h. p., and that means $500 per year. Above all things, if you are a purchaser of oil in any quantity, have it examined systematically. Adulteration, mistakes in purchasing and resulting accidents with serious repair bills, to say nothing of wasted power, run into money very fast.

BEARINGS.

Here is a subject in regard to which but little has been written except as to the ordinary plain journal. Volumes have been written about that. When all is said about this type of journal, we find it only a question of lubrication, nothing else. If the two metal surfaces can be kept separate by a film of oil, ever so thin, the friction is low; but once let the two metals get together and there is trouble at once. Sometimes anti-friction metals, such as babbitt, are used. But this is only to present a comparatively soft surface so that any necessary wear will take place quickly and with no injury

to the harder metal. Without the oil, however, a bearing of this kind is as much of a friction producer as any other. Many times have I seen the babbitt run out of a hot box and more often have I opened bearings and seen evidence of the metal having been in a melted condition some time after it had been placed in the bearing. In some difficult cases all sorts and combinations of metals are tried as opposite rubbing surfaces before the right one is found. We have no way in any case to determine exactly just what is right and what is not. All we can do is with our growing experience to make fewer and fewer mistakes. The ordinary bearing is an example of sliding friction and as long as we are dealing with sliding friction lubrication is all important. The lubricant, therefore, is certainly of more importance than the metals composing the bearing.

The type of bearing to which I have been giving my attention in the last eight or nine years is the so-called frictionless bearing. It is not strictly frictionless, of course, but in comparison with others it is in the proportion of about 10 to 1. In the first place, we have rolling friction in place of sliding friction. The same difference as exists between a car wheel with the brakes hard set so that the wheels are sliding and the wheel with the brakes loose. In fact, any wheel on a plain journal is an illustration of the two kinds, sliding at the hub and rolling on the ground. In my opinion it is by the proper use of frictionless bearings that the greatest savings are to be made from losses by journal friction. I look upon the Chapman double-ball bearing as the highest development of the type. By adopting such a ball bearing, for instance, all lubrication troubles disappear at once. The lubricant is of little or no importance in a properly designed frictionless bearing. All that is required is just enough to moisten the surfaces. For this a very thin mineral oil that will not allow rust or dry up is the best.

You will naturally ask why ball bearings have not been introduced faster. To me the explanation or reason is only too plain. Improper design and dimensions. The history of ball bearings tells its own tale. Practically the first appearance of ball bearings in trade was in the old high bicycle. At first they caused no end of trouble; riders did not understand them and allowed them to get out of adjustment, so that the balls often fell out entirely. Gradually, however, the newness wore off and the ball bearing gave perfect satisfaction in a bicycle. The makers shifted about as to diameters of ball and shape of bearing all the way from an eighth-inch ball to a three-eighths inch and from the two-point contact bearing to the four-point. It was the general impression that any diameter of ball would do as long as the contact was a point. At last, and only within the last four years, the ball in bicycles that has given best satisfaction has been made from ⅜ in. in the large bearings to ¼ in. in the smaller. Other sizes have been used, but ⅜ to ¼ is the most common. The larger ball is used wherever possible. It is not now realized by the maker that although theoretically the ball bears in points only, as a matter of fact a ball under a load seizes an appreciable surface for contact. That is, it compresses the metal until a surface proportional to the load is found. Consequently the larger ball requires this surface with the less indentation of metal. It is apparent, therefore, that the larger ball bearing will outlast the smaller, all other things being equal. Metal may not be deformed repeatedly without at last breaking down, and this is just what has happened with small balls. It is this that has delayed the introduction of ball bearings. Balls of proper dimensions have not been used in any but the most rare cases, and in those cases they have given most excellent satisfaction. These same remarks apply with rather less force to the roller bearing. More roller bearings have been built of proper dimensions than ball bearings. It is my opinion, however, that when properly designed for the work to be done, the ordinary ball bearing will excel any other type of bearing in efficiency and in good behavior. I speak now of the ordinary bearing; there is another bearing of the ball type that in my opinion excels all others. I did not think so when it was first brought to me, back in 1897, by the inventor, Mr. Chapman, but I made careful tests of it under all conditions and was convinced of its superiority by my own work and the resulting figures. This bearing is similar to a regular ball bearing except that between each ball that actually carries the load is a ball that keeps its neighbor from rubbing against it. The reason for this is plain.

Less than half of the balls of a bearing carry the load, especially if it is very heavy. They crowd each other under these conditions, the shaft tending to act as a wedge. The idle separating balls prevent the rubbing friction and actually diminish friction to a measurable degree and also lessen wear. The bearing is called the double ball bearing and bears the name of its inventor. Mr. Chapman, the inventor, is one of the very few that have realized the fact that a ball must be large in proportion to the work it has to do and has designed bearings of the ball type that behave perfectly under very heavy loads. In my laboratory basement I have a machine especially designed to test bearings. With it all speeds are possible within reasonable limits and all weights from 150 to 5,500 lb. load. By means of this machine I have determined the relative efficiency of the three types of bearing—the plain journal, the plain roller and the plain ball bearing. The results are absolutely conclusive and in favor of the ball bearing. I will give you just enough of the figures obtained to show the final comparison without troubling you with the immediate results. This is the first time I have made them public and I think it is the first time this class of work under so heavy a load has been done at all.

Friction Tests.

8 in. by 2½ in. plain journal—cast iron box hardened steel shaft, copious lubrication—revolutions per minute about 200.

	Loads. 369 lb.	4,480 lb.
Horse power required to maintain speed.....	.033	1.22
Corresponding coefficient of friction	.0191	.0738

Bearing 13 1-in. balls at each end—lubrication occasional, speed same.

Horse power required to maintain speed.....	.035	.121
Corresponding coefficient of friction	.0125	.00415

Bearing 36 ¾-in. rollers running on hardened rings and kept in line by brass cages most carefully made. Speed same, occasional lubrication.

Horse power required to maintain speed.....	.047	.306
Corresponding coefficient of friction	.0191	.013

In this same machine I put the regular bearing of a motor carriage just then put on the market, and ran it under about the intended load of actual service, to destruction—that is, until the bearing chipped so badly as to be useless. The load was 960 lb. and the length of time necessary to destroy it was six hours. The diameter of the balls was ¼ in. After much trouble in actual use they tried two rows of small balls at each end of the axle to remedy the trouble. It proved that the trouble doubled as well as the balls. Then ball bearings were condemned entirely, whereas the designer should have been condemned. One row of inch balls would have carried that load indefinitely.

The reason I am putting so much stress on the ball bearing is, first, because so little has been written in regard to the subject; in fact the only published tests showing careful comparisons have been put out as an advertisement by the Chapman Double Ball Bearing Company; second, because I believe that by means of so-called frictionless bearings the greatest savings possible from any one element of transmission devices may be made. I form my belief from the following facts:

Note the evils of transmission that I have shown. First, and the most serious loss perhaps results from overtight belts and from belt pull in general. A good ball bearing would cause this evil to dis-

appear or sink into insignificance. Consulting the table I have given, I find that in the case of the ball bearing, an increase in load on the bearing from 369 lb. to 4,400 increased the horse power required only from .03 to 12 h. p., and that the coefficient of friction actually diminished (apparent inconsistency due to conditions of experiment), whereas with the plain journal the horse power increased with the best of lubrication from .03 to 1.22, and the coefficient of friction increased from 2 to 7 per cent., showing an increase of friction with load ten times as great with a plain journal as with an ordinary ball bearing. Not once did I get this difference, but many times and by several different methods of measurement. Consequently as I have stated, belt pull and resulting pressure on bearings will cease to cut much figure.

Another serious source of trouble and friction would be entirely done away with—namely, all the difficulties of lubrication. A little light mineral oil put into a ball bearing at the outset to prevent rust and to moisten the surfaces will last almost indefinitely. The Chapman type is best as regards wear. Wear will not take place to a measurable extent in years providing the bearing be of the proper dimensions and design. There is less opportunity for wear with balls than with rollers, and moreover the bearing may be adjusted, which is not possible with rollers.

Unintentionally tight bearings in assembling a machine or shafting is another source of much friction. It is difficult to make a good ball bearing tight enough to increase the coefficient of friction under any considerable load. The adjustment should be such that it may be set up by hand in order that the sense of touch may control the degree of tightness to the nicest point. Wrenches need not be used. Shafting out of line with plain journals brings severe strains on the bearings; while ball bearings properly built will increase the friction due to this defect but very little.

Loose pulleys equipped with ball bearings might be disregarded as a cause of friction. To be sure the belt remains and causes friction, but the tightness of it no longer matters, and a loose pulley driving a machine would be no longer possible. In place of the figure given by Mr. Webber of 10 per cent for the friction of loose pulleys and their belts one may safely say that it would be less than 5 per cent.

For these reasons I lay so much stress on "frictionless" bearings. Difficulties, of course, will be met, but no more than with the plain journals and the endless combinations of materials and dimensions that have been found necessary to overcome plain journal troubles. If half the good engineering talent had been put on ball bearings that has been put on journals the problem would be solved now, and the plain journal would be rare. I know that I am open to strong criticism in expressing these opinions, but I do so after due deliberation and after eight years of practical experience. To be sure years ago the ball bearing was a commercial impossibility because of excessive cost, but now with automatic machines to turn out the parts, good cheap steel to use for the bearing surfaces and our superior knowledge of how to treat the steel cheaply, this cause no longer exists. Even now several drill presses, lathes and sets of rolls are made with ball bearing equipment and are rendering good service. Such failures of these machines as I have seen I know would not exist with larger balls. It took a long time to find the best sizes for the bicycle, and it will naturally take some time to find the best practice for other machines. The natural conservatism of the mechanic and designer retards this knowledge to some extent, but the point will be reached sooner or later. Carelessness of design was the cause of failure in the following case of the attempted use of roller bearings. A very heavy swing crane was assembled in a foundry at the top of which it was determined to put rolls so that it would swing easily. The casting designed for a plain journal was bored out so as to make room for some ½-in. rolls. Nothing else was done. The result was that the rolls and shaft were quickly ground up, as if in a mill. Then the hole was bushed with brass, the journal smoothed and the crane put to work. Finally rolls were condemned. Here is another case which ended in success. A double 6-in. belt failed to drive a set of rolls for cold rolling of metal. It was backed up with a 4-in. double belt and still gave trouble. Ball bearings were then put in of ample dimensions. A 3-in. single belt was put on and ran the mill.

Before leaving the frictionless bearing I must call attention to the great advantage of the type as regards starting friction. The starting friction of this type is about the same as the friction of motion. The starting friction of a plain journal may be extremely high and always is very high. The explanation is that during rest the shaft settles through the lubricant and the condition is metal to metal or nearly so. The start is therefore difficult. In one set of tests that I made the proportion was as 1 to 54. This is a serious matter where frequent stops are made. In transmitting power in the mill or shop it is of little consequence, as perhaps the shafting is only started two or three times a day.

The following questions were put and answered:

1. Will the Chapman double ball bearing of which you speak stand up under weight such as railway and street car service?

Yes, if applied in accordance with ideas of the inventor, Mr. Chapman. The dimensions must be large (balls about two-thirds diameter of axle), with proper emergency journals and end thrust cushioned. Such bearings have been designed and are now in use on a street car in Massachusetts, giving perfect satisfaction.

2. What is your experience as between the roller bearing and the ball bearing?

In every case that has come to my notice where a ball bearing was properly designed, the result has been absolutely satisfactory. On the other hand I have yet to see roller bearings put to actual use that have not given some trouble due to the inherent difficulty of taking care of the end thrust, and of preventing rolls from getting out of line and resulting wear. There may be cases where the roll would serve better than the ball, but they are rare.

Can the double ball bearing be used to advantage on all shafting and journals?

This I have already answered, inasmuch as I have recommended the ball bearing for all such uses above all other types and have also said that the Chapman double ball bearing is the best of the type because of its freedom from wear, its low coefficient of friction, and its intelligent development to meet all conditions of load and use.

Another query has reached me by mail, as follows:

If a shaft, say 2½ in. in diameter, running in the usual way, but with the motion of 2 in., was run with ball bearings, would two rows of balls be necessary? If run with one row, could it hurt the shaft?

If the end motion were necessary, I would allow it to continue by mounting the ball bearing on a slip fit sleeve. Rotation would take place on the balls and end play on the sleeve. One or two rows of balls would do in accordance with other minor considerations.

A New Industry.

Chattanooga, Tenn., is to have a new brick plant industry. Luke Smith, formerly of the Citico Furnace Co., is to have charge of the new enterprise and work will begin at once on the east side of Mission Ridge, five miles from the city, on the line of the Southern Railway, east of the tunnel on the John Fereton property. Work on cutting crossties and grading for a sidetrack has commenced.

On the right and left of the railroad the ridges are chert gravel, and compounded material for fire-brick. Also there is an abundance of material for white and colored building brick, together with superior sand. So the enterprise is four-fold—to mine and ship chert gravel for roads and streets, to make fire brick on the spot for shipment, as well as white and colored brick and the mining and shipping of sand, especially for foundry purposes.

Burnt Clay for Highways.

In "Brick" for December, 1901, page 267, we published a paper read before the Roadmasters' and Maintenance of Way Association by W. Shea, of the Chicago, Milwaukee & St. Paul Ry., in which was summarized the experience of the steam railroads with burnt clay for ballast.

In the Review of Reviews for January, Charles Rollin Keyes discussed the use of burnt clay for macadamizing highways in an article from which we take the following extract:

The railroads handle the clay and carry on all operations connected with its burning by machinery. The burnt gumbo, ready for use, can be delivered on board the cars at a cost of 25 to 35 cents a cubic yard. When burned by hand, as would naturally have to be done in highway improvement, the cost would be, perhaps, 10 to 15 cents more. The railroad gumbo pits are often a mile or two long and hundreds of feet wide. In the case of the highways, the mud would merely have to be shoveled out of the roadway, burned, and shoveled back.

While for macadamizing purposes on country roads burnt gumbo is not quite so durable as some of the best grades of rock, it has many advantages to offset this one shortcoming, slight as it is. The process of producing burnt gumbo requires practically no capital or great skill to carry on. The most ordinary labor and a little common sense on the part of one person, as overseer, can produce the best of results. Of course, the road should be properly graded and crowned before putting on the gumbo road metal. A surface of burnt clay six to eight inches in thickness, is commonly sufficient for good results; or ten inches in particular places, where unusual conditions exist or traffic is especially heavy.

By selecting for improvement the heaviest parts of the road first, since the worst stretches are often caused by the very material that makes the best grade of road metal, and systematically working under intelligent guidance, five years would find every principal highway in a county as passable the year around as a paved city street, and at very little more cost than is usually squandered on "working the roads." The county supervisor could easily superintend the whole work for his district; and, with local overseers as head burners, he could soon produce as good a system of highway as any one could wish for. Once properly prepared two men could easily keep the roads of a whole county always in good repair.

With no more expenditure of money and effort than is now put on the country roads, ballasting with burnt clay would produce in a dozen years a system of highways equal to any of those for which France has so long been famous.

A burnt gumbo road is never muddy, for that property is lost in the burning. The surface of the road is hard and smooth. As a speedway for bicycles and automobiles it is ideal. For carriages and heavy wagons it has no superior. No vegetation can grow on it. It is practically free from dust, after the highway system has been well developed, so that mud is not brought in from the tributary roads. Moreover, the warm red highways contrast pleasingly against the green landscape at those seasons of the year when country drives are most enjoyable.

The process of burning clay is quite simple. Along the roadside, cordwood is piled to form a low pyramid or ridge 8 to 10 ft. wide. On this is thrown 3 to 4 in. of coal slack, and 12 to 20 in. of gumbo mud, which is cut from the roadway, or a pit, as the case may be. On firing the wood, enough air enters the pile to enable slow combustion to be carried on without the generation of too much heat, which would vitrify the clay.

When a "pit" is made, as often is necessary when burnt gumbo has to be hauled some distance, or, as is the usual way with the railroads, new additions of slack and mud are added each day on one side of the pyramid, while on the other side the burnt gumbo is allowed to cool and is then carried away. In this way the pit advances sideways a few feet a day until it has become several hundreds of yards across.

The gumbo clays have many notable qualities, besides being excessively sticky in wet weather, enabling them to be readily distinguished. They usually form what the farmer calls cold, sour soils. These soils cannot be tilled to advantage. The land occupied by them is almost worthless, except, perhaps, for scant pasturage at certain seasons of the year. The clays absorb and are capable of retaining an immense amount of water, often so much as twenty-five gallons to a cubic yard.

Permission to locate a railroad ballast pit on some farmer's gumbo land is usually readily obtained. He not only gives his consent and the use of the land free, but he is secretly delighted at the idea of having the railroad excavate without cost to him a big pond for his stock.

The best clays for making burnt ballast are distinguished by certain physical properties. They are very plastic, quite impure, very fine grained and tenacious. Their tensile strength is enormous, often as high as 400 pounds to the square inch. The shrinkage is very great—10 to 12 per cent in the drying and burning process. These are the technical tests for recognizing these clays. A ready, practical test is to find the very worst stretch of a muddy country highway.

Orders Taken by the C. W. Raymond Co.

The C. W. Raymond Co., through its New York office, has recently received orders from the following brick companies: The Stockton Brick & Pottery Co., Tesla, Cal., for the large brick plant designed by H. G. Layng and to be erected at Tesla for the manufacture of all kinds of fancy and common bricks, pottery, cement, etc., a 999 machine, new automatic down cut cutting table, 14-ft. pug mill, two "Victor" represses, hand presses, etc. Kelly Bros., of Haverhill, Mass., who have decided to abandon the soft-mud process and have ordered a No. 10 clay separator, No. 2 compound geared pug mill, a 777 machine, down cut automatic cutter, cars, barrows, etc.; also an Erie City engine and boiler plant. The Boston Paving Brick Co., of New Britain, Conn., for its new plant, a 999 machine, two 9-ft. independent Muller dry pans with elevators and screens, a 12-ft. pug mill, automatic cutter, two "Victor" represses and a 10-tunnel hot air drier. From H. Gilbert, Plaistow, N. H., who is greatly enlarging his plant. From the Stockton Brick & Pottery Co., Stockton, Cal., two 9-ft. independent muller dry pans.

John Kessler, of Sawyer, Wis., has remodeled his plant and expects to turn out over a million bricks this season. Last year his output was 500,000 red brick.

Messrs. Bell, Williams & Miles have purchased a site for a brick-making plant at Upland, Ind. Preparations are being made for the erection of a large and modern building.

A syndicate, of which William Lockhart is at the head, has leased extensive tracts of fireclay in Lawrence and Butler counties, Pa., and it is understood that a contract has been awarded John Wertenbach & Co., of McKeesport, for opening the clay pits.

Charles A. Hoshour has sold his brick plant at Cleburne, Tex., and purchased stock in the Oklahoma Brick Co., of Oklahoma City, O. T., and will be superintendent of the company's plant. Mr. Hoshour requests us to announce that he will receive at his new address the catalogues and printed matter such as have heretofore been sent him.

Continuous Kilns.

BY ARTHUR E. BROWN, B. SC. LOND.

PART II.

(Continued from page 141 January, 1902 "Brick."

It is now necessary to construct about the galleries, the dimensions of which have been decided on, a mass of brickwork of suitable solidity and provided with all the working adjuncts of the kiln.

It will be best to describe this by detailed reference to drawings showing the best practice. First, however, it is perhaps expedient to say a few words as to the site of the kiln. Solidity of foundation is obviously an essential, and the only other is the dryness of it. Moisture must be excluded at all cost, and a damp situation should be concreted all over before commencing erection. In Germany the concrete is sometimes even covered with a layer of bituminous material protected from the heat by a layer of sand. This is an unnecessary refinement.

If the kiln is built on a stratum of strong clay, always somewhat moist in its native state, the concrete bed is advisable because the heat which descends into the ground dries and to some extent burns the clay, causing considerable shrinkage which disturbs the brick structure and causes cracks in it. In many such cases it has been found sufficient to put a good bed, 12 in. thick, of lime concrete under the walls of the kiln only.

The more familiar form of construction, at least to the English manufacturer, is that with sloping side walls. It is the style suited to the larger sized kilns and may be described first by reference to the accompanying drawings, which give all the details necessary for the building of a kiln.

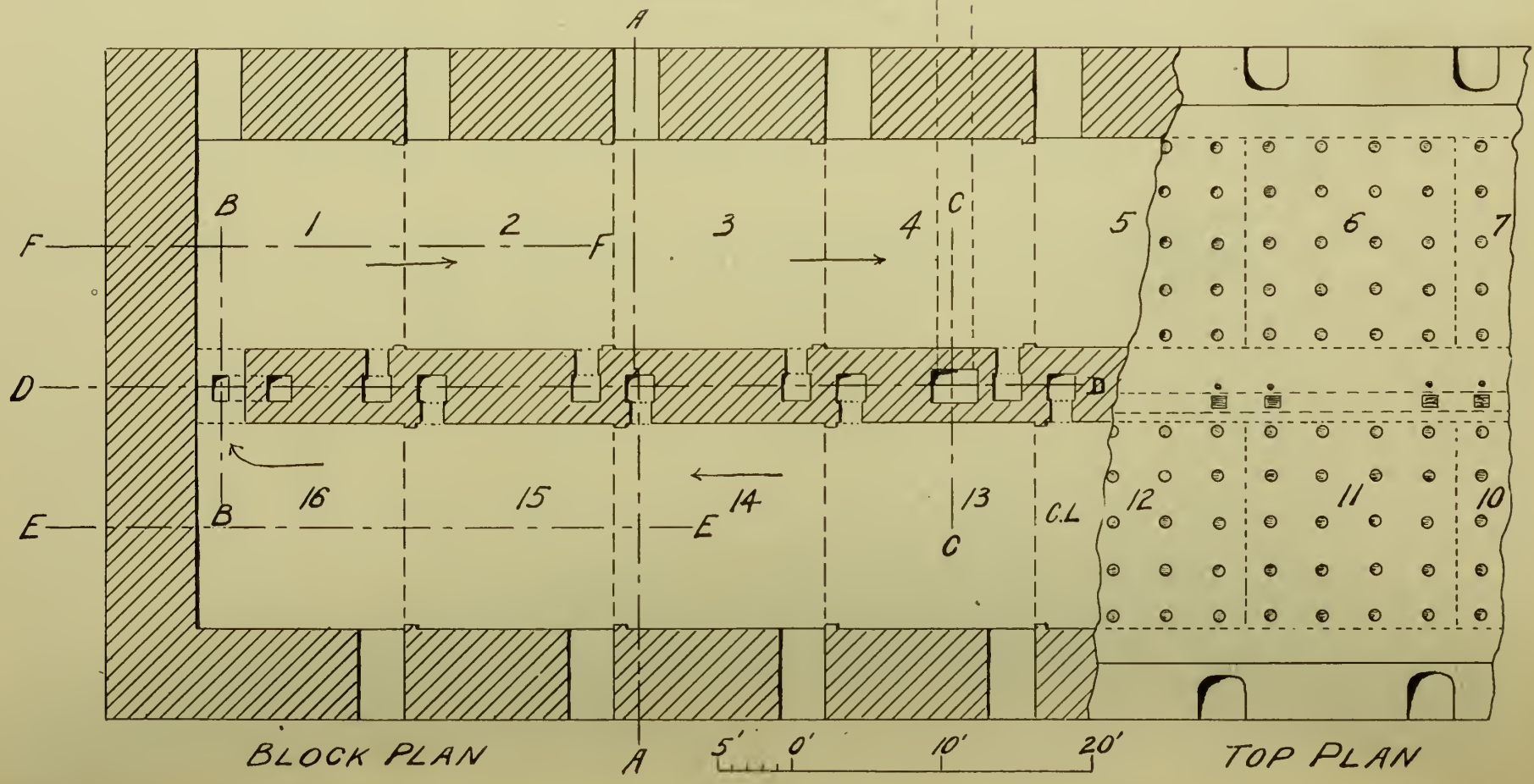


FIG. 5.

Fig. 5 is a block plan at ground level giving general features. The 16 chambered kiln covers a space of ground 124 ft. long by 45 ft. wide. Each chamber is 14 ft. square and 8 ft. high at the crown of the arch, having a total capacity of 1,274 cu. ft.

Taking 15 bricks to the cubic foot these chambers would contain 19,000 bricks (8 in. x 4 in. x 2½ in).

A "drop arch" *a* is shown at the end of each chamber, and may be constructed in cases where the bricks contract in burning, as is frequently the case in England. (See Fig. 6.)

A wicket C', 3 ft. wide and 5 ft. 6 in. high gives admission to each chamber. The kiln is rectagular and is provided with connecting passages L at the ends, 5 ft. 6 in. wide and 4 ft. 9 in. high, and in these, bricks may be set for burning if ample clearance is allowed for draft.

Each chamber is provided with a smoke flue F at the end, leading into the kiln flue J. The smoke flue is 1 ft. 6 in. wide and high, the damper chamber H, 1 ft. 9 in. square, and the kiln flue J, 3 ft. high by 2 ft. 3 in. wide. At each end, the end chamber is connected with the kiln flue by an opening in the floor of the connecting passage.

The damper chambers are controlled by cast iron bell-dampers and frames h, which may be of the simple type shown if the iron

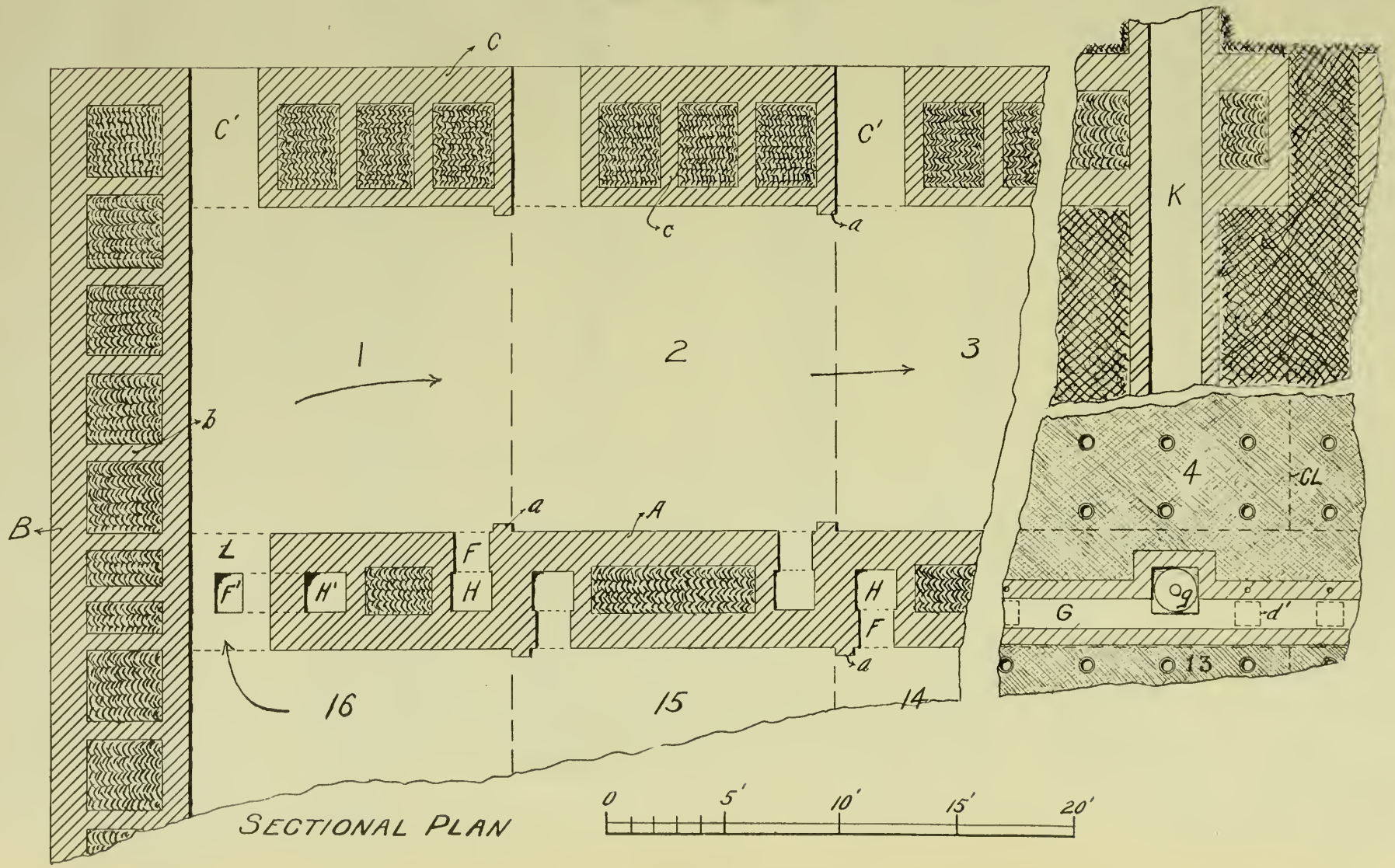


FIG. 6.

rod of the bell passes through a pipe as a guide. The rod may be ¾ in. in diameter and the pipe of 1 in. bore.

Each chamber has 20 feed holes D. These occur every 3 ft. 6 in. longitudinally. Transversely they are not symmetrically spaced, but are distributed so as to supply more heat near the side walls that near the center. The outside holes are only 9 in. from the center to wall, and 3 ft. from center to center of the next holes. These latter are 3 ft. 3 in. from the center one. The holes are 4 in. in diameter in the arch itself and may be extended by common drain pipes or by brick flues to the top, where they are covered by a cast iron bell cap and plate of such form as to exclude air when closed.

Above the kiln flue is the hot air flue G, 18 in. deep and 15 in.

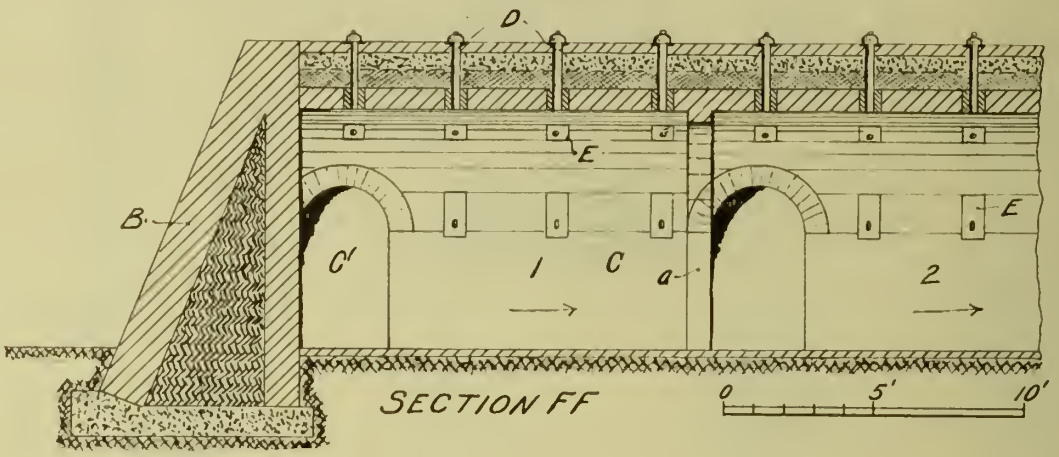


FIG. 12.

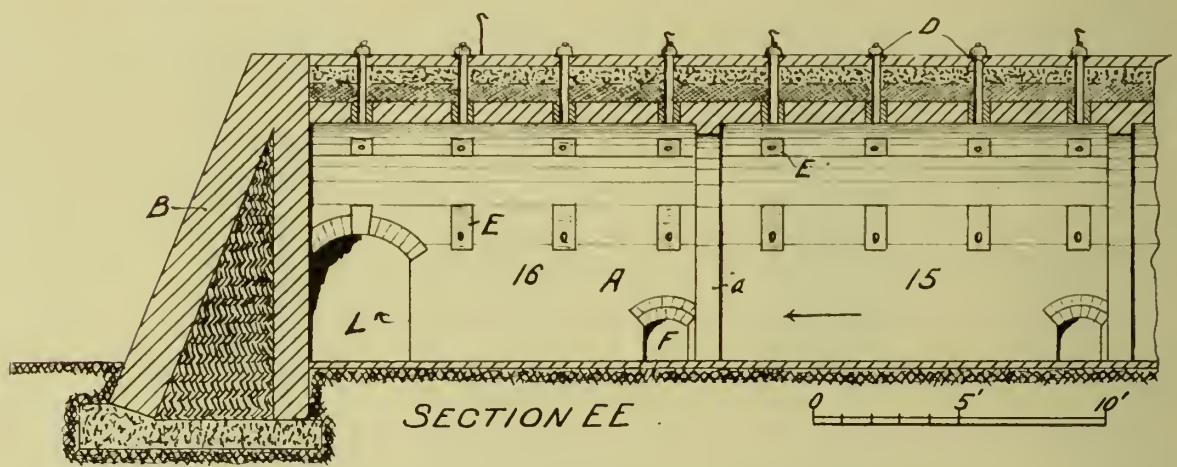


FIG. 11.

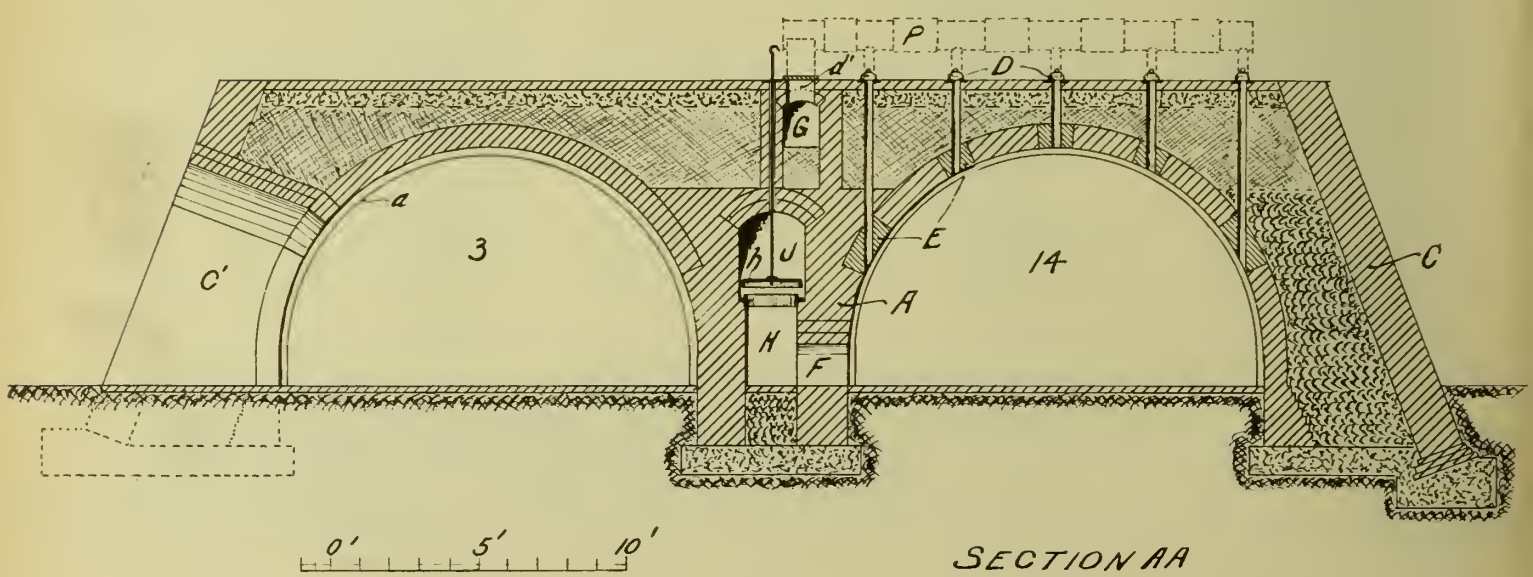


FIG. 7.

wide. This is provided with square or round openings d' 12 in. in diameter, one or more to each kiln chamber. One to each is shown in the drawings.

The simplest and most satisfactory connection of this flue with the chambers is in the form of a set of sheet iron tubes, shown in dotted lines in Fig. 7.

The main tube is made in sections, 12 in. in diameter, which are

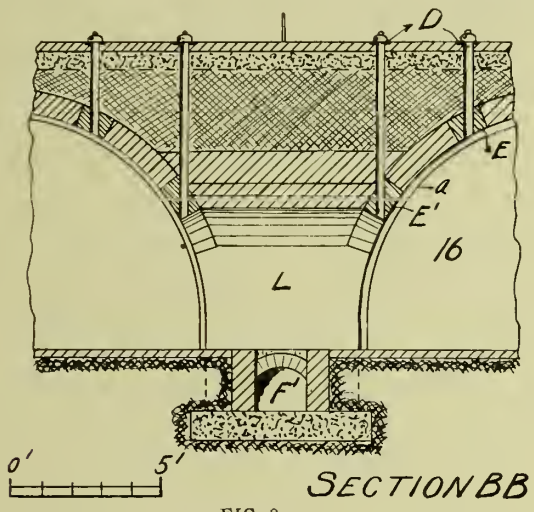


FIG. 8.

connected by long collars of slightly larger diameter sealed at the joints, after adjustment, by strips of paper pasted round them. The branches to the feed holes are 4 in. in diameter and to the hot air flue 12 in.

In this method the advance warming is effected by a downward current of hot air.

In the hot air flue a damper chamber is shown near the center of

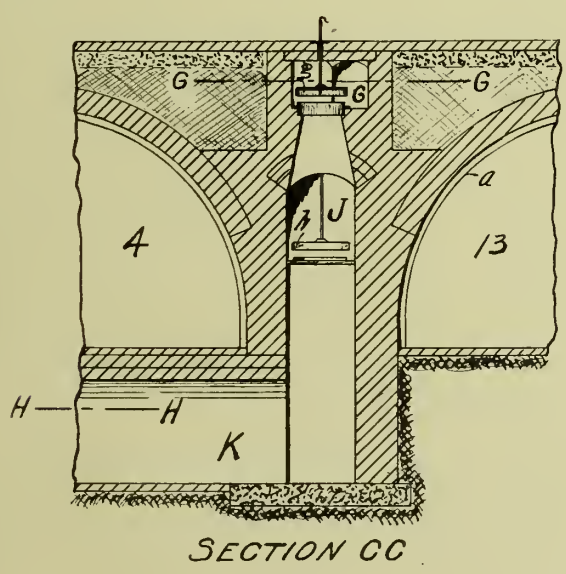


FIG. 9.

the kiln, forming a connection with the kiln flue by means of the bell damper g.

The kiln flue J is connected with the chimney by the main flue K which is situated as near the center of the kiln as circumstances will permit. This flue may be 2 ft. 3 in. wide and 3 ft. 6 in. high.

The details of the kiln construction are shown in Figs. 6 to 12 all to the same scale.

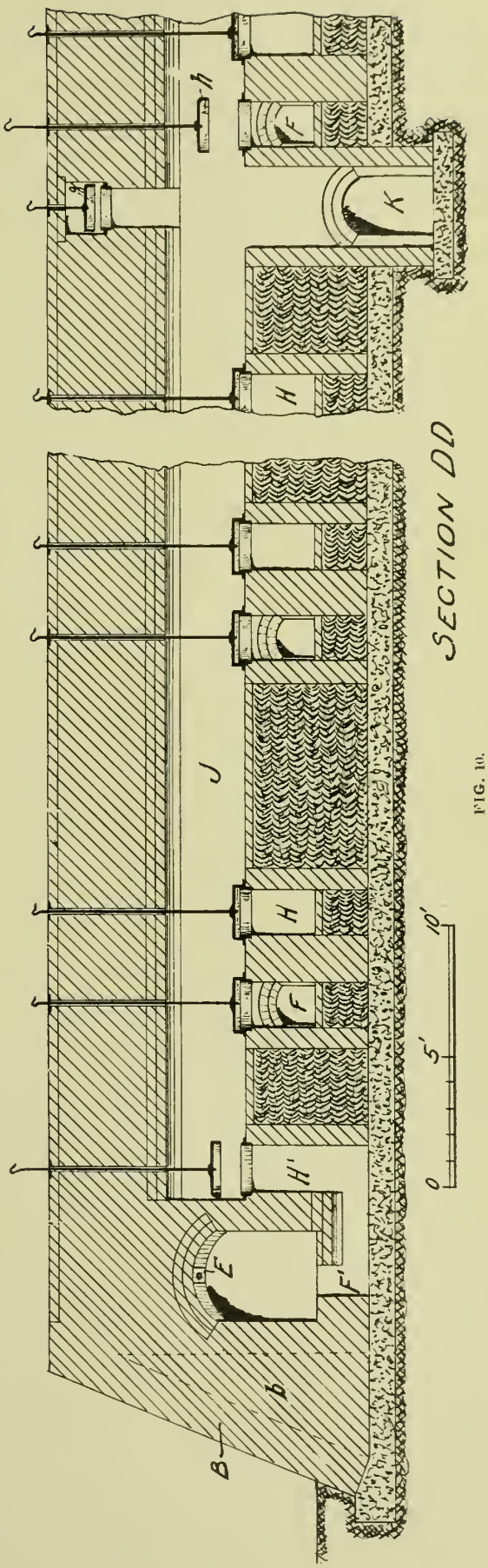


FIG. 10.

Fig. 6 is a detail plan illustrating a horizontal section at ground level, the two smaller detached portions being horizontal section on the lines G G and H H of Fig. 9. This figure shows the pocketing of the external walls B and C by means of the 9-in. web walls b and c. The web walls are necessary to give the requisite stability to the walls when not constructed of solid brickwork. They may be carried up to the full height of the kiln across the main arch, but are not necessary beyond a height of 6 ft. 6 in.

Fig. 7 is a complete cross section on the line A A of Fig 5. It shows the arrangement of the main arch with the feed hole blocks E. The adjuncts of the kiln are shown marked with the letters previously detailed.

The external longitudinal wall C is 18 in. thick, and is built with a slope of 1 in 2½. The main arches are 9 in. thick and the total width of the external work at ground line, 6 ft. At its thinnest point the walling is 4 ft. 9 in. thick.

Up to a height of 6 ft. 6 in. from the ground the pockets between the outer wall and the arch are filled with earth rammed tight while in a slightly moist condition. This is shown with a herring-bone hatching in the drawings, a shading used throughout to indicate the rammed earth filling.

Above the 6 ft. 6 in. line the fine-crossed hatching indicates a filling of loose dry material, which may be any incombustible mixture of larger and finer portions, such as sand and broken bricks. It covers completely the crown of the arch. Above is a layer of lime concrete is shown which may be from 6 to 9 in. in thickness. The concrete is indicated by a dotted shading. It serves as a level bed for the brick paving of the top of the kiln and more particularly as an air-tight covering of the loose filling over the arch.

The center wall A of the kiln, which contains the kiln flue J, is 5 ft. wide at ground line. Earth-filled spaces are formed in it between the damper chambers in order to economize bricks, but the kiln flue itself is contained between solid brickwork up to the 6 ft 6 in. line. The 1-in. pipe rod guides, which pass through the arch of the kiln flue are built into one of the 9-in. walls of the hot air flue G. This flue is constructed near the top of the kiln.

Fig. 8 is a partial transverse section on the line B B, showing the connecting passage L, which forms the communication between chamber 16 and chamber 1.

The end smoke flue F is shown in section.

Special feed hole blocks E' are required in the outer rings of the arch over the connecting passage.

Fig. 9 is a partial transverse section on the line C C, illustrating the main flue K, the down flue to which from the kiln flue J is 3 ft. by 3 in. The position of the main flue is shown in horizontal section in Fig. 6. The figure also shows the chamber in which the damper g works. This damper, which is for special purposes to be mentioned later, provides a means of connecting the hot air flue G with the kiln flue J in the manner indicated. The damper frame has an opening 18 in. in diameter. Its position in horizontal section is shown in Fig. 6.

Fig. 10 is a longitudinal vertical section on the center line D D of the kiln. This line cuts through the end wall B, web wall *b*, the whole length of the kiln flue J and one containing wall of the hot air flue G. All the damper chambers and dampers h are seen and the smoke flue openings F on the further side of the central wall A. The connecting passage L is seen in section and the main flue K in elevation. The connection of G with J is also seen.

Fig. 11 is another longitudinal vertical section, now on the line E' E through the middle of the near barrel of the kiln.

The end wall B here shows the filling in the pockets between the inner and outer containing walls 14 and 18 in. in thickness, respectively. The end wall has the same slope, 1 in 2½, as the side walls and is also 6 ft. thick at the base.

The central row of feed holes is cut through and others are seen in elevation. The first of these is 1 ft. 9 in. from the end and the others are all regularly spaced 3 ft. 6 in. apart centers.

The drop arches are seen here in section and elevation. They are shown 9 in. wide with 4½ in. projection into the chamber. The connecting passage L and the smoke flues F are seen in elevation.

Fig. 12 is a third longitudinal vertical section, this time on the line F F through the center of the far barrel of the kiln. This indicates in elevation the wickets C', and other features previously mentioned.

The next article will deal with further details of some features of the construction indicated and a discussion of the reasons for the adoption of the general typical forms shown.

List of Clayworkers' Associations and Their Officers.

AMERICAN CERAMIC SOCIETY.

Ernest Mayer, Beaver Falls, Pa., president; Francis W. Walker, Beaver Falls, Pa., vice-president; Edward Orton, jr., Columbus, O., secretary; Stanley G. Burt, Cincinnati, O., treasurer.

ILLINOIS CLAYWORKERS' ASSOCIATION.

W. S. Purington, Chicago, president; J. C. Mamer, Campus, vice-president; G. C. Stoll, Wheaton, secretary; William Hammerschmidt, Lombard, treasurer.

IOWA CLAYWORKERS' ASSOCIATION.

W. W. Lewis, Williamsburg, president; S. C. Beasley, Council Bluffs, vice-president; R. Goodwin, secretary and treasurer. Next meeting place Ames, Ia.

NATIONAL BRICK MANUFACTURERS' ASSOCIATION.

George M. Fiske, Boston, president; Clifford Chase, Milwaukee, first vice-president; H. C. Bradley, Cleveland, O., second vice-president; John C. Miller, Washington, D. C., third vice-president; T. A. Randall, Indianapolis, Ind., secretary; John W. Sibley, Birmingham, Ala., treasurer.

NORTHWESTERN BRICK MANUFACTURERS' ASSOCIATION.

E. M. Farnham, president, C. A. Sprandel, vice-president; Louis Moline, secretary and treasurer. Next meeting place, Minneapolis, Minn.

OHIO TILE, BRICK AND DRAINAGE ASSOCIATION.

W. C. Wilson, Brice, O., president; W. W. Chadwick, Condit, vice-president; E. O. Bigelow, New London, treasurer; Edward F. Darnell, Grove City, secretary.

SOUTHERN BRICK MANUFACTURERS' ASSOCIATION.

A. L. Wight, Albany, Ga., president; H. H. McClure, Rome, Ga., and E. A. Copeland, Birmingham, Ala., vice-president; H. L. English, Atlanta, Ga., secretary and treasurer.

WISCONSIN CLAYWORKERS' ASSOCIATION.

Maj. J. W. Hinkley, Green Bay, president; W. M. Meadows, Burlington, vice-president; George J. Schwarz, Milwaukee, secretary; J. G. Hamilton, Grand Rapids, treasurer. Next meeting place Green Bay, Wis.

F. L. Warner, manager of the Standard Pressed Brick Co., of Crawfordsville, Ind., is personally supervising the work of repairing the old plant of Martin & Co. which the Standard company has purchased, and expects to have it ready for business early in April. Several new kilns are being erected and the capacity of the plant will be increased to 30,000 brick per day.

OHIO VALLEY LETTER

FROM OUR SPECIAL CORRESPONDENT

The Clearfield Clay Working Co., of Clearfield, Pa., is running its extensive plant full time, turning out quite a variety of bricks, all of which are certainly of a very superior quality. The majority of the output of this works consists of paving blocks, but buff building bricks, dry pressed, wire-cut and repressed, are also made in large quantities. The machinery employed at this plant includes three large tubular boilers, one 200 h. p. slide-valve engine, two 9-ft. iron frame dry pans, a pug mill, an American auger brick machine, a Freese automatic cutter and an American double-die repress. A dry press is also used, on which machine a portion of the face bricks are made. Two driers are in operation, one being of the steam variety and the other is what may be termed a direct heat drier. In the former the better grades of bricks are dried and in the latter the cheaper variety, also the paving blocks. When I use the term "direct heat" in this connection, I mean just what the words imply, as the furnaces in the drier where this system is used are so constructed that all the smoke and heat pass direct from the furnaces into the tunnels and thus through the bricks in process of drying, there being no other outlet or smoke flue, such as is used in many driers. While the bricks after being subjected to this very severe process are pretty thoroughly dried, they also present anything but a clean appearance. In fact they are literally black. It is claimed that a drier of this type answers very satisfactorily where no particular color is sought, but for making a finer grade of bricks, such as some made at this plant and dried in the other variety of drier referred to, there seems to be some advantage in treating the bricks to a much less severe operation in order to obtain desired and proper results This plant is furnished with adequate burning capacity, the kiln being all down draft and mostly of the square pattern. The company has recently erected several small, down-draft kilns, which are used exclusively for burning face bricks. These small kilns will possibly contain, when filled, 40 M standard size bricks. They are small in every way, and being quite low (the bricks being set possibly 20 high for burning) the hard work of high tossing is very largely eliminated. The material used at this plant is a plastic fireclay and the company is possessed of a large acreage of it. Its natural color when burned, without any mixture, is a very rich buff. There seems to be quite an extensive stock of paving brick on the yard at this plant, but it is understood the greater portion of this stock is contracted for and shipments will be started soon.

On the line of railroad running from Tyrone to Curwensville, Pa., there are situated quite a number of fire brick plants, some large and some small, and all seem to be running full blast at this time. The flint clay, which is found here in large quantities, is considered of a very high grade, and in fact, so far as my knowledge goes, it stands without a superior in many respects in the United States. The fire bricks made from this material are shipped to all eastern points and they also go hundreds of miles west. Many tons of the raw materials are also shipped daily to fire brick plants located in different sections, some of which are more than 150 miles distant.

T. B. Freeman, a Pittsburg brick dealer, has been elected treasurer of the Penn Branch Brick Co., a concern composed principally of Pittsburg parties, whose plant is located at Blairsville Intersection, Pa., some 50 miles east of the city. Mr. Freeman is a man of wide experience in the brick business and will have full charge of the company's office and selling departments. The Penn Branch Brick Co. is starting off this season with an excellent run of trade, having orders booked now sufficient to maintain the plant in full operation for some months. The product is red building bricks.

There seems to be a diversion of opinion among brickmakers as to what is the best method to pursue in performing certain portions of the work and in operating to the best advantage different departments of a brick plant. This thing was called to my attention quite vividly recently by a dispute between two members of the brickmaking fraternity, the point in controversy being whether it is most economical in down draft kilns, to set the brick very high in the kilns for burning, leaving but little space between the top of the bricks and the crown, or whether it is better to set the brick lower, leaving a large vacancy on the top. This work is done both ways and I have personal knowledge of many plants where round kilns are filled almost to the crown, say 33 or 34 courses high, and and others again where just the reverse is the case, 22 or 23 courses being the limit. In the first instance, the principal claim made in favor of this practice is that by the high setting it is possible to place the maximum number of the bricks in the kiln and some brickmakers argue that it requires no more fuel to burn a kiln of bricks full to the top than would be consumed in burning a kiln partially filled. On the other hand it is claimed by those who are in the habit of burning the low-set kilns, that it is not only possible to save about two days in the length of time consumed in burning, which, of course, means a corresponding saving in the amount of fuel burned, but that better results are invariably obtained. My own experience and observation teach me that if a first-class brick is desired, the better policy is to set the kilns low, say about 24 or 25 courses in height, as it is far more certain that a more uniform color and hardness will be obtained by this method, than where the bricks are piled up to the crown, which frequently means a large percentage of soft bricks in the kiln bottom. As far as fuel consumption is concerned, there is possibly little difference either way, for while the low-set kilns of course require a shorter length of time to burn than the high-set ones, the latter may possibly contain a third more bricks than the former, so that the few days time saved in the burning is probably off-set in the other case by the number of bricks contained in the kiln. I think it is safe to say that, all things being equal, a certain amount of fuel is required to produce certain results, no matter whether the bricks are set high or low in the kilns.

The several plants of the Mt. Savage Fire Brick Co., located respectively at Keystone Junction, Williams and Hyndman, Pa., have been sold to a company composed of Johnstown parties, among whom are H. J. Haws, Judge Francis O'Connor, John H. Waters and Scott Dibert, all of whom are leading business and professional men of that city. It is also understood that Mr. Ravenscroft, of Ridgway, Pa., is a member of the company. It is stated the consideration in the transaction was $180,000. J. J. Hoblitzell, the senior and controlling member of the Mt. Savage company, has for many years been a conspicuous figure in the fire brick manufacturing industry of that section and has met with good success. Mr. Hoblitzell has also been identified for some years in other manufacturing industries which it is understood

have netted him quite a snug sum of money, and that simultaneous with his retirement from the brick business, he will cease activity in other matters.

The car situation does not seem to have undergone very much change during the last month. While the conditions are possibly a little easier than existed last fall, it is still impossible to secure cars in sufficient quantities to make shipments as desired.

The Pennsylvania Clay Manufacturing Co., of New Kensington, Pa., has secured a large contract for red building bricks to be shipped to Pittsburg. The contract, it is thought, will extend throughout the entire summer season, with shipments at the rate of 400 M. per month, which will be within 100 M. of the entire output of the plant.

It is stated by certain manufacturers that the paving brick business is not starting out quite as good this season as was expected, but it is really a little early at present to predict to a certainty just how great the demand for that article is going to be this year. Then, on the other hand, while a condition of slackness seems to exist with some, it does not apply to all paving brick manufacturers. I am convinced that the majority of them have large orders booked, shipments on which are being withheld on account of the unsettled weather conditions. There is also another view which may reasonably be taken on this subject, namely: there is a certain class of manufacturers, not alone in the brick business, but in other lines of manufacture as well, who might truthfully be termed pessimists, at least so far as that word relates to matters of this kind. That is, it matters not how busy they may be, there would still be the same persistent howl about "hard times" and poor business. Such persons, however, are not hard to understand and may be "spotted" with comparative ease. The statements are as a matter of course made for effect, for at the time they are being made, in many instances, the very persons who make such assertions, may be either enlarging their own plants, or buying or building others. My assertions in this connection are not mere guess work, neither do they emanate from any fertile imagination, but I am personally familiar with just such instances and could mention the parties by name. The sum and substance of such pessimistic declarations as those referred to, is that they are the result of a fear of competition.

A rock crusher will be placed in the clay grinding plant of G. A. Coleman, at New Galilee, Pa.

An engine and boiler are being installed at the works of the Delaney Fire Brick Co., Fairchance, Pa.

The fire brick plant at Rogers, O., which has been standing idle for some months, has been placed in operation. This plant was built last year and had only been running but a few weeks when the cold weather set in. It is equipped for the manufacture of hand-molded fire bricks exclusively, and its machinery equipment is therefore not very extensive, including little besides engine, boiler and wet pan. The bricks after molding, are placed on a hot floor for drying, and burned in down-draft kilns, of which there are four in number, all of the round pattern and 26 ft. in diameter. The plant is quite conveniently arranged for the purpose intended, but is not large, having a daily capacity of possibly 8,000, which would mean employment for two molders. The fireclay used here is understood to be of a very good quality.

The plant being erected by the Monongahela Clay Manufacturing Co., near Monongahela City, Pa., is nearing completion and when finished according to plans as now outlined, will be a works of considerable proportions. The first thought was to build a plant for making about 25 M. bricks per day, installing one 9-ft. dry pan and building a drier with five tunnels, with a corresponding kiln capacity. The plans have now been changed, however, and it is the intention to double that capacity and an order has therefore been placed with Stevenson & Co. for a second 9-ft. dry pan and an addition of five tunnels is also to be built to the Pittsburg dryer. Several down-draft kilns are also in course of construction and it is the purpose to erect 12 of these as fast as the work can be done.

Two plants are being installed at Beaver Falls, Pa., for the manufacture of red building bricks, one of which is almost ready for operation which will be equipped throughout with second-hand machinery. This plant will have a small capacity and the bricks (stiff-mud) will be cut on a hand machine. The site is on the outskirts of the city and on the Pennsylvania Railroad. The other plant is being installed by the Mound Brick Co., a concern lately organized, and is situated in the center of Beaver Falls. The purpose of the Mound Brick Co. in building this plant is to grind up and make into bricks what is known as the "mound," and in the removal of this body of earth a double purpose will be served, for while bricks are being made and sold at a good margin of profit, the property will at the same time be made more valuable, since by the removal of this mound a number of excellent building lots will be made in the thickly settled part of the city. The new plant being located in the heart of the city will be possessed of many advantages and one of these which is worthy of great consideration is the fact that it will be possible to deliver bricks, in wagons, to a good portion of the city trade at least, so that the cost of transportation to the different points of consumption will be reduced to a minimum. The machinery outfit purchased by the Mound Brick Co. will be new, excepting possibly the engine and boiler. The equipment will include an E. M. Freese & Co. union brick machine with automatic cutter, one Stevenson 9-ft. iron frame dry pan and a hot-air tunnel drier.

The town council of Cannonsburg, Pa., has awarded a contract to Hummell & Carroll, of Marion, O., for the construction of a sanitary sewer to cost upwards of $34,000.

Two "Perfect" clay screens will be installed at the new works of the East Ohio Sewer Pipe Co., now in course of construction near Irondale, O.

According to reports, the sewer pipe plant to be erected by H. B. Camp & Bro., at Akron, O., will be an extensive affair and it is understood no time will be lost in completing arrangements to start on the work.

William Franz, of Allegheny, Pa., has been engaged to superintend the building of brick plant located at Dickersons Run, Pa.

The American Clay Working Machinery Co., of Bucyrus, O., has installed a large combined machine, together with a rotating automatic cutter in the works of the Vanport (Pa.) Brick Co. This, like several neighboring plants, is also undergoing a considerable amount of repair work and improving, with a view to increasing its capacity.

The Vance pottery at Tiltonville, O., will be increased in capacity by the erection of additional kilns.

Robert Porter, formerly with the Toronto (O.) Fire Clay Co., has been engaged to superintend the manufacturing department of the Allegheny Valley Brick Co.'s plant at New Kensington, Pa.

The Speer Clay Manufacturing Co. has been organized in Pittsburg, with a capital stock of $100,000 and has acquired the fire brick works of Douglass & Whisler, located near Vanport. Pa. The present equipment of this plant besides the customary amount of engine and boiler power, consists of two 9-ft. iron frame dry pans, an augur brick machine with automatic cutter, two pug mills, a Victor repress and a 4-tunnel Sharer drier, and its product includes both stiff-mud building bricks and hand-molded fire bricks. Since the acquisition of this plant by the new company various changes have been undertaken, the intention being to greatly increase its capacity. These changes will include an additional 4-tunnel hot air drier which is to be built by the drier company at Pittsburg, an E. M. Freese & Co. union brick machine, with rotating automatic cutter, and the erection of additional round down-draft kilns. With the completion of these additions and improvements, this plant will rank among the foremost of such establishments

along the Ohio Valley. It is understood to be the intention of the new concern to pay little attention to the manufacture of hand-molded bricks, but the stiff-mud department of the works will be pushed to its utmost capacity.

At the works of Gloninger & Co., Vanport, Pa., a slip occurred in the hill-side, the earth from which greatly damaged a new dry pan which had just been installed.

W. N. Humphrey & Bro., of Brookville, Pa., will erect a plant for the manufacture of brick and hollow ware and orders have been placed with the Bonnot company of Canton O., for a union brick machine, two 9-ft. iron frame dry pans, screens and small apparatus and with the American Clay Working Machinery Co., of Bucyrus, O., for a rotating automatic cutter. The Humphrey Bros. have, for many years, been engaged in the lumber business near Brookville, but owing to the growing scarcity of timber in that vicinity, they have been virtually compelled to retire from that branch of industry and after casting about for another line of manufacture, they have settled upon the clay-working business, this decision, as a matter of course, being largely due to the fact that the firm owns an extensive area of shale and clay land. It is apparently the intention to install a plant of considerable size and while bricks will be made at the outset, the ultimate product of the works will be a full line of fireproofing and building blocks. It might be interesting to note in this connection that the lumber business on what is known as the Low Grade Division of the Allegheny Valley R. R., on which road the town of Brookville above referred to is located, will soon become an obsolete industry. This condition arises from the fact that the hemlock timber with which the mountains there formerly abounded, has been almost all removed, and little timber remains standing at this time except what are termed "scrub" trees. Up until the last few years, the line of railroad mentioned was a veritable hot-bed, almost its entire length, for saw mills, planing mills and a variety of wood-working establishments, a large portion of the product from which was transported to Pittsburg, and other cities, in the form of rafts, which were floated down the several streams, and the term "after rafting" was as significant in those days as the farmers' "after harvest." That state of affairs, however, is rapidly dying out and many of the erstwhile lumbermen have turned their attention to other lines of business and most of those remaining are contemplating such a move. As the outgrowth of this condition quite a number of clay works, of various kinds, have been established, and it is safe to predict, on account of the mineral resources and other natural advantages of that particular region, others will follow.

The Steelton & Harrisburg Brick Co., of Harrisburg, Pa., is changing one of its plants from the soft-mud to the stiff-mud process. A soft-mud machine which has only been used at this plant a very short time, has been removed and in its place is being installed an auger machine furnished by the Chambers Bros. Co., of Philadelphia, and an automatic cutter supplyed by the same firm. A tunnel drier is also being erected here, the design of the latter having been formulated by the management of the plant. The heat for this drier is supplied by means of a series of steam pipes, running lengthwise in the bottom and sides of the tunnels. There are six tunnels, with two tracks in each. The Steelton & Harrisburg company owns three brick plants in and near the city of Harrisburg, all of which are now equipped with Chambers auger machines and end-cut automatic cutting tables. All these plants are now running full time except the one which is undergoing the change and the latter will be ready for resumption in a few days.

The red brick plant of the Washington (Pa.) Brick Co. is closed for a week to make certain changes in the machinery and general arrangement of the works.

The Myers Clay Manufacturing Co., of Toronto, O., has decided to operate the coal on its property, and to this end the work of opening a mine has been started. The vein of coal found here is possibly three feet thick and is considered very good fuel for certain classes of work.

There seems to have been no definite action taken as yet with reference to locating the much-talked-of $75,000 white-ware pottery at Irondale, O. It is understood, however, that prospects for locating such an enterprise there are very flattering.

E. E. Francy, of Toronto, O., has been chosen as superintendent of the American Sewer Pipe Co's. Ohio Valley plant, located near the town of Toronto. Before the formation of the American company Mr. Francy was a part owner of the large Forest City sewer pipe works, also situated at Toronto, but this plant was absorbed by the American company at the time of its organization. Since that time Mr. Francy has devoted the majority of his time to other of his many interests and has given little attention to the sewer pipe industry. By virtue of the fact that the gentleman referred to has given up the greater portion of his business career to the manufacture of sewer pipe and brick, with which line of work he is thoroughly conversant, there is every reason to believe the American Sewer Pipe Co. has acted wisely in its choice of a superintendent for the Ohio Valley plant.

In order to afford more extensive storage room for green clay, an addition is being built to the clay tipples at the Minor works of the National Fire Brick Co., located at Empire, O.

It is understood additional surface acreage has been purchased by the owners of the Standard Brick Works, at Empire, O., this acquisition being for the purpose of extending the yard area of the plant.

It is asserted that the loss at the Pioneer white-ware pottery, at Wellsville, O., by reason of the late fire, may foot up $10,000.

Information is given out that another fireproofing plant is to be established near Youngstown, O., by the General Fire Proofing Co., of that city. If reports are correct, the plant will be an extensive affair.

The Globe Fire Brick Works, located near New Cumberland, W. Va., for many years owned by James Porter, of that place, has just been sold to Fred and Bennett Porter, sons of Capt. John Porter, of Wellsville, O., who for more than a score of years has been a very conspicuous figure in Ohio Valley brickmaking circles and who at one time bore the fitting appellation of "Brick King," which title was probably accorded him by virtue of the fact that he was the recognized originator of the paving brick industry in the United States. It is understood the Globe works, under the new ownership, will henceforth be run to its full capacity, and that improvements are under contemplation with a view to increasing the output.

The building industry at Harrisburg, Pa., is said to to be starting off unusually brisk this spring, as a result of which all brick plants in and near the city, the number of which is decidedly limited compared with other less populous sections, are quite thronged with orders. In fact it is asserted the demand is far beyond the present visible supply, and in order that the calls for brick may be met at home, there is a possibility of another plant being installed there the present season. The large demand for brick this year may be largely attributed to the fact that extensive improvements are being made at the mills in Steelton, a manufacturing suburb of Harrisburg, and to the further fact that other large iron and steel mills are going up near the city, in the construction of which several millions of bricks will be consumed.

Contracts have been awarded by the Duquesne Fire Proofing Co., of Pittsburg, for the erection of a sewer pipe works to be located in Butler County, Pa., some 40 miles north of Pittsburg. The contract for the greater portion of the machinery has been let to the Stevenson Co., of Wellsville O.. which firm will supply two dry and two wet pans, one large sewer pipe press and a variety of other apparatus such as is required in the equipment of a modern

plant of that character. Two "Perfect" clay screens are also to be furnished by the Dunlap Manufacturing Co. The Duquesne company was organized by Pittsburg parties some two months ago. It seems to have been the original purpose to style the concern the Keystone Fire Proofing Co. and application was made for a charter under that name, but the latter was not granted by reason of the fact that it was discovered upon investigation another firm had already adopted that title and had been granted a charter, hence the change to Duquesne Fire Proofing Co. It was also the intention at the outset to install a plant for the manufacture of fireproofing, as the name denotes, but certain conditions arose which caused a change in plans, although it is not unlikely a line of fireproofing and hollow building blocks will be made later, or after the sewer pipe department of the works is thoroughly established and in successful operation. Work on the required buildings is to be started at once, as is also the work of erecting a number of down draft kilns. George H. Albertson, for many years manager of the extensive brick works of Booth & Flinn located on Ruchs Hill, Pittsburg, has been elected manager for the new concern and is in complete charge of the building and equipment of the factory, which is to be built on modern lines in every particular. The Duquesne Fire Proofing Co. is composed of a number of influential business men and bankers of Pittsburg who will see to it that nothing is lacking to make the new enterprise a success.

The United States Fire Proofing Corporation, which was organized in Pittsburg some weeks ago, has already acquired a number of plants, two of which are located in Lisbon and one in Salineville, O. These plants have hitherto been run on bricks exclusively, the one at Salineville turning out paving bricks and the two at Lisbon producing both fire and paving bricks. It is the purpose of the new company, however, to convert all the works into fireproofing plants and to this end a number of changes have been started. At the Salineville plant a "Champion" rock crusher, furnished by the Good Roads Machinery Co., of Kennett Square, Pa., will be installed, and at the Keystone works, located at Lisbon, a 6-tunnel Pittsburg drier is being built and additional down draft kilns are also to be erected. With these improvements it is thought the works will be in readiness for turning out hollow ware, the stiff-mud machinery there being about what is required for the new product. At present the Keystone plant is equipped with one 9-ft. dry pan, a small Freese auger machine with separate pug-mill, a hand cutter, a large steam-heated dry floor, and four down draft kilns. Of course, with the new additions the capacity of the plant will be largely increased. At the Coleman works, however, also located at Lisbon, a great amount of work has been undertaken. In fact two of the buildings there have been razed to make room for a more commodious structure and a tunnel drier. Work on the new building has been started and this is to be built on lines with special reference to the manufacture of a general line of hollow-ware. The plans for the improvements were prepared in the Pittsburg office of E. M. Freese & Co., which firm is supplying a considerable amount of tthe necessary equipment for the plant, including an auger brick machine, with pug mill attached, a variety of dies, tables specially arranged for cutting, fireproofing and hollow building blocks, shafting and pulleys. The engine which has been in service at this plant for some years was considered inadequate to meet new conditions, so this is to be displaced by a 200-h. p. engine to be supplied by the Houston, Stanwood & Gamble Co., of Cincinnati, O., and a 100-h. p. boiler (to be used in conjunction with a boiler now in place) which will also be furnished by the same concern. A 6-tunnel drier is also being built by the Pittsburg Hot Air Drier & Construction Co., the cars for which will be furnished by the Ohio Ceramic Engineering Co., of Cleveland, which firm will also supply cars for the Keystone drier referred to. There are at the Coleman works six down-draft kilns, and it is the purpose to erect two others of the same type. With the completion of the improvements mentioned, the Coleman plant will be well equipped for the work intended. The fireclay at both the Keystone and Coleman works is of a very superior quality, being quite plastic, and there is every indication that it is specially adapted for the manufacture of hollow-ware. William Weaver, formerly superintendent of the Magnolia (O.) work of the National Fire Proofing Co., of Pittsburg, has been elected manager of the United States company and has full charge of the manufacturing end of the business and it is under his supervision all improvements are being carried on. Mr. Weaver is thoroughly familiar with this line of work and will, without doubt, make a pronounced success of the portion of the business ascribed to him by the United States Fire Proofing Corporation.

The Atlas Bolt & Screw Co., of Cleveland, O., has sold a large order of cars to the Fayette Manufacturing Co., of Pittsburg. These cars are to be of special design intended for use in drying magnesia bricks.

Obituary.

Hiliare Remillard, organizer of the Remillard Brick Co., of Oakland, Cal., died at his home in that city March 26th, aged 67 years. Mr. Remillard was a Canadian and had been engaged in the manufacture of brick in California for 25 years.

Francis P. Byrne, of the firm of Peter Byrne & Son, brick manufacturers, Philadelphia, died March 28th. Mr. Byrne was 36 years old. He was well-known in business circles and was a member of the North Penn Trotting Association.

Henry Bieg, of Brooklyn, N. Y., a prominent manufacturer of pottery, died at his home at 253 Throop Ave., Brooklyn, April 17th. Mr. Bieg was 56 years of age. He had been ill for a year.

Fires and Accidents.

Fire destroyed two store houses of the Kansas City Hydraulic Pressed Brick Co., April 14th, together with a greater part of 1,500,000 brick which were stored in them. The loss on the buildings is estimated at $3,000. A spark from a passing engine is assigned as the cause of the fire.

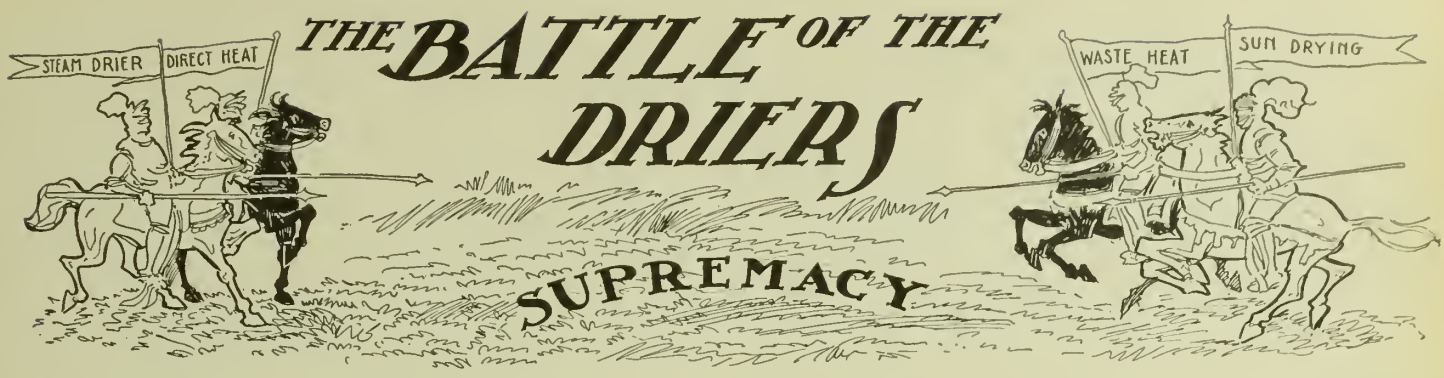
The Harvey Bolin Pottery, Zanesville, O., which was operated by the firm of Munch & Stroop, was destroyed by fire April 17th, entailing a loss of $2,000, insured. The fire was caused by an overheated stove.

The Akron (O.) China Co's. plant was destroyed by fire April 15th, causing a loss of $5,000. Two hundred employes are thrown out of work until the plant can be rebuilt.

The clay manufactory near Barnitz, Pa., owned by W. T. Asbury, of Philadelphia, was burned to the ground on the 16th ult. The loss is reported at $10,000, with no insurance.

Operations have been resumed at the North Alton (Ill.) Brick Works.

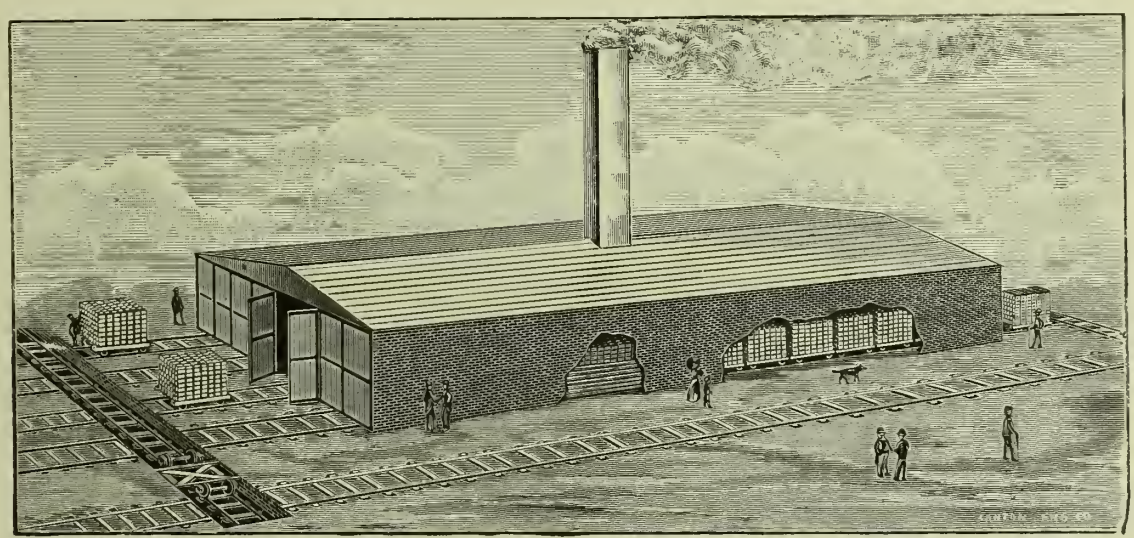
Frank J. Brown, Columbia Building, Topeka, Kan., is promoting a company to develop the rich clay deposits two miles west of Topeka. Sample brick of this clay are of an unusual dark terra cotta color, and are said to equal brick which sell for from $20 to $25 per M. A plant with a capacity of 20,000 brick per day can be installed for $15,000, according to the estimates which Mr. Brown has presented to the Commercial Club of Topeka.



The Starkey Down Draft Drier.

In the design of the Starkey down draft drier the inventor proceeded upon the theory that in drying bricks the temperature should be rapidly raised to a high point and the moisture contained in the bricks converted into steam and driven out in that form, instead of drying the surface at a lower temperature and abstracting the moisture in the interior by absorption. The advantage claimed is that the outside of the brick is kept moist until the water contained in it has been converted into steam and expelled because of the great increase in volume, in changing from water to steam, and checking of the brick thus prevented. The description of the apparatus and method is as follows: The bricks are placed in a tunnel in the ordinary way. The tunnel has a tightly closed top, and on the side walls and under the cars are steam radiators. The heated air rises and cannot escape and there being no cold air inlet the temperature quickly rises to a high point. As the bricks are heated the water is converted into steam, which passes from the center to the surface permits uniform shrinkage and reduces checking to a minimum. As the tunnel becomes filled with steam the air passes the saturation point and water is precipitated, and is drawn off at the bottom. Openings to stacks are provided at the bottom of the drier and the excess of moist air escapes through these. An analogy may be drawn between the making of steam in the drier from the moisture in the bricks, and making steam in a boiler; the temperature will rise more quickly and less fuel be required if there is no influx of cold water into the boiler, and so in the tunnel drier no cold air is admitted after the start. The conditions as to the precipitation of the moisture are similar to those that produce ordinary rain. There are no fans, blowers, shafting, belts or pulleys connected with the drier, and this reduces both the cost of installation and operation.

The claims made for the Starkey drier are: Economy in first cost, in running expenses. Its operation is uniform and entirely independent of the weather. There are no regulating devices needed; it is only necessary to keep the radiators supplied with steam. There is no machinery to break and cause stops that are liable to end in checking the brick. The shrinkage of the product in drying is uniform. The down draft system will dry the bricks in less time than any other.



STARKEY DOWN DRAFT DRIER.

The patentee of the Starkey down draft kiln is John Starkey, of Minerva, O., who has received most flattering letters concerning the satisfactory operation of his driers which have been installed in the plants of the Minerva (O.) Paving Brick Co., the Kittaning (Pa.) Fire Brick & Clay Co., the Van Port (Pa.) Fire Brick & Clay Co., Hull & Smell, Williamsburg, Ia., and others.

The E. V. Johnson Co., operating a brick and fireproofing plant at Twin Bluffs, Ill., has disposed of all its property in La Salle County to Henry E. Lineaweaver, of Pittsburg, Pa.

Charles Beall & Sons, Painesville, O., in March secured property in the western part of the town and early in April began the construction of a steam brick yard which is to have a capacity of about 25,000 per day. The machinery for this will be furnished by the Horton Manufacturing Co., of Painesville.

CORRESPONDENCE.

By reason of its large circulation "Brick" offers exceptional advantages for the exchange of information on practical subjects in which the clayworker is interested, and we urge our readers to avail themselves of the "Brick" correspondence columns, and lay their questions and troubles before their fellow-workers, some of whom are almost sure to know the best solutions for the problems. All answers which we can print will be paid for at our regular rates. Where the subject permits of it a sketch or drawing will often add greatly to the clearness of the answer.

BRICK IS GOOD.

Enclosed find $2.00 for two subscriptions to "Brick." "Brick" should be kept on file by subscribers to refer to for information on special subjects; I find it very valuable in this way. The second subscription is for one of my workmen. I have been very busy during the past winter rebuilding the 14-chamber continuous kiln for the Christy Clay Co., of St. Louis; as I make a specialty of kiln construction; "Brick" is the paper for me.

Geo. W. Howes.

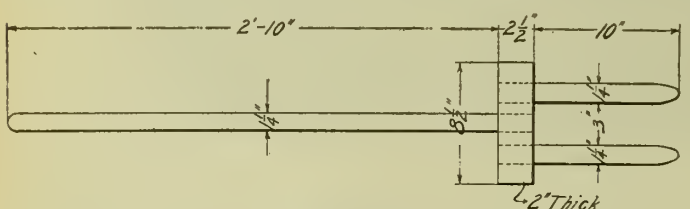
ENAMELED BRICK.

Editor "Brick":—Being an interested reader of "Brick" and knowing the value of your correspondence columns I will trouble you with a few queries. Is the demand for enameled brick equalled by the supply? What is considered to be the best finish for a good enameled brick—brilliant or dull? What is the best price paid for a good enameled brick? Is a white enamel successfully applied to a red front brick? I would be glad to have some of your readers answer me through your columns. Yours truly,

Trenton, N. J. Interested.

NEWS BREEZES FROM SOUTH DAKOTA.

Editor "Brick": I write after a winter's rest, a portion of which I spent in South Dakota. That is a naked barren land, and they have not the facilities for improvements that they need; they lack building rock and timber, and get water by digging 25 to 50 ft.



TILE FORK.

It might properly be called all one prairie, almost level, occasionally a sag or dent in the surface. It is all blue sky ahead and behind you, no hills, no trees to break the vision, it is nice to look over. There is good black soil 10 in. to 2 ft. deep underlaid with yellow clay, sand and gravel, which produces largely when there is rain to start the crops. I saw many large farms from 300 to 600 acres well stocked with cattle, sheep and horses. Horses are not fed or stabled, except one driving team; they live on the wild grass but look well, cattle the same. Sheep do well, but must be cared for as the wolves kill them if left to roam; sheep are housed at night and must be guarded in daytime. I saw herds of sheep 800 to 1,000 in a ranch and one ranch had 2,300 nice large sheep. This herd was coralled at night in a 3-acre lot enclosed by a board fence about 6 ft. high, and turned out on the prairie in day time with one or two herdsmen on ponies and two dogs for protection from wolves.

I am just starting on yard and tile factory work after a winter's rest. I have sold many loads of tile this spring, we load quite a number of teams every day besides shipping by car lots and have many orders on hand to fill yet. The outlook for tile trade is good at good prices. The brick trade is better than usual with a large demand for brick both at home and abroad. We have a large banking house to build to cost $15,000 to $20,000 also a large brick church with several other contracts already let and very fine brick on hand.

We made some improvements in mining brick clay. We use four long wooden wedges made of cord wood sticks about 4 in. thick at the large end with an iron band around the top. Setting the wedges 2 ft. apart on a line about the same distance from the edge of bank and driving them in with a heavy sledge, will bring down a large amount of clay in a short time in perfect safety; no danger of being caught in a fall. First dig under edge of bank, then go on top with wedges and then it will split off in large flakes and you are safe. Mine and throw back a large row of clay at a time, shower it well with water at the bank. Let it lie a few days and then run it in for pressing. It makes a much stronger and better brick when treated in this way. Always keep a large pile of clay tempered ahead; it pays well. All clay does not work alike; keep the different grades of clay needed well mixed to insure good brick. You must be able to judge what and how to treat the clay before pressing. I have tried many ways in order to make a success and this has proved the best for me, after many years' experience in the business. Never set up a poor brick to dry, never allow a poor brick or tile to be set in the kiln, send such back to the bank, soak, and make over. Work of any kind half done never pays anyone.

I have also a scheme for loading tile. I have invented a fork to load tile with which does away with the labor of stooping and the backache. Gloves or no gloves there is no wear on the man that hands them up. The fork will handle any size up to 8-in. We could not do without a tile fork to load with. When two men now come for tile they want to do the loading with fork as it is so easily done. Just try one awhile and you won't try to load without a tile fork. I will give a description of the fork. The head is 8½ in. long by 2½ in. wide by 2 in. thick, and has two prongs set 3 in. apart; the prongs are 10 in. long from point to head and 1¼ in. thick. The handle is 1¼ in. thick and 2 ft. 10 in. long from the end to the head. No man will discard this fork after trying it a little while.

Yours truly,

Monticello, Ia. John Gibson.

ROOFING TILE PROPOSITION IN CUBA.

Editor of "Brick": Through the columns of your valuable publication I would like to call the attention of your readers to the fact that there is a splendid opportunity for the establishment of a roofing tile plant here in Cuba. The French-style roofing tile and flooring tile used on this island are imported from France and sell at a very high price, the roofing tile fetching about $65.00 per M. and the flooring tiles, 14x14x¾, about $55.00 per M. I am in possession of the very best clay and sand banks in Cuba and shall be pleased to send samples of the clay and sand to anyone who would entertain with me a joint proposition to commence an industry of this nature. Only the small capital of $8,000 or $10,000 would be required to start a factory near the city of Havana, where my lands are situated.

Now is the time to start business in this wonderfully rich island The Cuban Government will be established here on May 20th, and,

as you know, will have the guarantee of stability from the United States, the best guarantee possible for any money invested here. I have a thorough knowledge of the manufacture of brick and other clay products and with proper machinery I am sure that a company could make a great deal of money in this new industry here. As a native of the island, I have an extensive knowledge of the business conditions and a wide commercial connection. I shall be pleased to hear from any of your readers who would be disposed to take this matter up in a practical way and give the very best references in New York and Washington and also in this country regarding my honesty and ability. In Washington I am known personally to Mr. Cortelyou, secretary to the President.

I trust that in the near future the land of Cuba may possess a roofing tile plant of this character, and I am convinced that it would be one of the most paying investments ever made.

Yours truly,

Havana, Cuba. E. Castro.

STEAM DRY FLOORS.

Editor "Brick": I have become very much interested in an article entitled "A Modern Steam Dry Floor," which appeared in "Brick" for November, 1900. A brickmaker is a great hand to try new experiments, at least some of them are, and when I read of something new and different from the old way and it looks practical, I try to make use of it. And this dry floor seems to be such a practical scheme, that I wish to correspond with some parties who have such a drier in operation. Also I would like to know whether C. M. Hurt, who wrote the article referred to would prepare working plans for me; I would rather pay well for proper plans than try to build the floor myself without them. I wish to use the best material in its construction, and would like to know if the slag cement is made from slag such as can be got at any of the small iron foundries, and is it hard to reduce to the proper degree of fineness. Can I grind it in my 7-ft. dry pan used for grinding clay?

At present I am drying my bricks on slats in stalls in sheds and they do not dry fast enough, especially on hot, calm days in summer. It takes from four to six weeks to dry them with this method of drying and I am compelled to shut down my machinery very early in the fall on account of the ware freezing before it is dry.

Yours truly,

Monroe, Ia. G. H. Orcutt.

REPLY BY MR. HURT.

Editor "Brick": I am glad to answer Mr. Orcutt's letter forwarded to me for a reply. The dry floor referred to in my article in "Brick" was built by George Carlyle, superintendent of the Olive Hill Fire Brick Co., of Olive Hill, Ky., in 1895. Since that time I have furnished working plans and specifications for others (all these floors are giving entire satisfaction) and will be glad to do so for Mr. Orcutt.

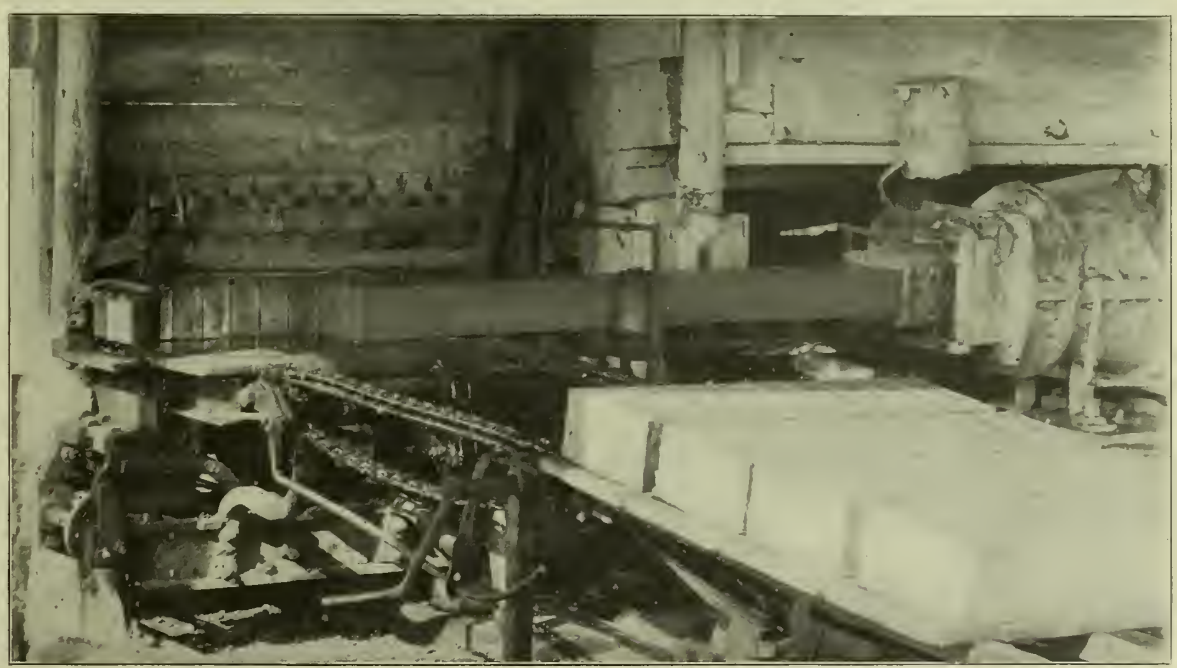
The slag cement is made from any slag from a blast furnace using lime rock for flux. This slag can be ground in any dry pan used for grinding clay, but it should first be crushed in a crusher or broken under a hammer. The pieces fed to the dry pan should not be larger than a goose egg. It should be ground as fine as fire clay, but the pan should be stopped every two hours and the iron taken out.

Yours truly,

C. M. Hurt.

INTERESTING LETTER FROM ENGLAND.

Editor "Brick": Your readers will probably be interested in the following description of a cutter and loading table that I have invented.



FRONT VIEW OF CUTTER AND LOADING TABLE.

My cutter is an automatic board delivery with a loader attached. The bar of clay, as it moves from the machine up to the stop, moves the table and sets the cutter in motion. The cutter separates the bar into bricks and then brings them onto the board immediately in front of its original position. Then the lifting machinery carries the board and bricks from the cutting table to the loading table, it all being done by one revolution of the mechanism. When four

boards (as a rule) are on the loading table the boy in attendance turns the crank and slides them onto the barrow. This work and putting boards on the cutter are all the boy has to do, except cleaning the wires; and a boy 13 years old can attend the machine for cutting and loading from 18 to 20 thousand brick per day.

The two illustrations show the machine at work. I patented this about four years ago and arranged with one of the largest machine makers in England to make them, paying me a small royalty. After three years' delay I have had word that the machine men consider my machine primitive, but would give me no information as to what trouble he had experienced with it. It is more difficult to make a machine of this kind than to build a pug-mill or a set of rolls.

Having no facilities to make these machines for the market, I am sending the photographs to "Brick" and hope that if you publish them some brother brickmaker or an enterprising American machine man may like the idea, and try making them; then, if he realizes a fortune, he may remember the poor inventor and give a present to him.

SIDE VIEW OF CUTTER AND LOADING TABLE.

This machine has been at work four seasons and has cut several millions of brick. As seen in the illustrations there is a bar to clean the wires; this bar is pressed down by hand and returned by a coiled spring, so that the wires are cleaned by one movement of the bar and framers.

Yours truly,

T. Buck,
Barnwell Brick Works.

Cambridge, Eng.

WHO SHAVE THEIR CLAY?

Editor "Brick": I wish to learn of any parties who dry their clay by shaving it when taking it from the bank before it enters the disintegrator or pulverizer; also, to get any particulars as to the proper method for the erection of a planer or shaver for such purpose. Possibly some of your numerous circle of readers will be able to give me some information as to the best method to be pursued.

Yours very truly,

R. J. N.

Canada.

Pottery News.

Reports from Findlay and Columbus, O., say that a deal has been closed by The Bell Pottery Co., of Findlay, for the purchase of a tract of land upon which a branch of that company's plant will be erected in the near future. The company has been making a strictly high grade vitreous porcelain at its old works in Findlay and it is thought that the new plant will be devoted to the manufacture of the same class of goods. It is probable, also, that a part of the plant will be devoted to the manufacture of electrical porcelain.

The new works of the Dresden China Co., to be erected in Salineville, O., will be started at once. The building will be 320x150 ft. All of the buildings will be of brick and will be of the most modern and complete that money can put up. Six kilns will be erected at once and others will be added as fast as they are required.

J. P. Morgan, of New York, has purchased the Garland collection of oriental porcelains, the finest collection in the world and which has been on exhibit at the Metropolitan Museum of Art in New York for many years. It is said that the price paid by Mr. Morgan was in excess of $600,000.

The Sebring Pottery Co., of Sebring, O., will build two more five-kiln potteries in Sebring within the next three months. The Sebring's have three plants in Sebring, already, the first to be built was that of the Oliver China Co., which was erected three years ago, one year later the Sebring Pottery Co built, and one year ago the French China Co., making a total of 18 kilns, all of which were devoted to the manufacture of electrical porcelain. The firm also owned a 6-kiln plant at East Liverpool and another at East Palestine, until recently when these were sold, the two new ones to be built at Sebring replacing them. The plants will be up-to-date in every feature and will be complete in every detail. Contracts have been let and the buildings will be begun at once.

The Shenango China Co., at New Castle, Pa., burned the first kiln last week, and the results are very pleasing. The company has a full line of both dinner and toilet ware and an excellent line of decorations and the goods should prove good sellers. The New

Castle Pottery Co., of the same place, is reported as running full in every department, its strictly high grade china being a fine selection and being equal to anything on the market. The company is also adding some new shapes to the already extensive lines.

The works of the Keystone Pottery Co., at New Brighton, Pa., have been completed and the company is now putting in machinery and getting everything in shape for starting up. There are two kilns. The company is headed by H. C. Rigby, formerly superintendent of the Keswick China Co's. plant at Beaver, Pa.

The plant of the Steubenville Pottery Co., at Steubenville, O., was idle for a few days last week, owing to some repairs that were being made on the clay presses.

The Columbia Encaustic Tile Co., of Anderson, Ind., is building two additional kilns to the already large tile works in that city. Eastern parties are doing the work. The company built two kilns last year.

The Answood Pottery Co., of Chittenango, N. Y., is installing some new machinery in their works for the production of artistic terra cotta, of which it is making a specialty.

The Electric Porcelain Co., of East Liverpool, O., is building an additional kiln and it is stated on good authority that it will add at once a building in which machinery will be installed for the production of dry pressed goods such as cleats, insulators, rosettes and specialties. Up to the present time the company has operated in wiring tubes only.

It is said that several large additions will be made at the works of the West End Pottery Co., which is located at West End, East Liverpool, O.

Extensive improvements are to be made at the plant of the Benty Pottery Co., which is known as the Oakwood pottery, at Oakwood, O. The plant contains but one kiln and up to the present time has been operated in a line of art ware. A new engine is to be installed at once, new jiggers and lathes put in and the plant started up in full. A line of white ware will be made which will include plates, teas and saucers, fruits, etc. will be made. ..

The Ironsides Pottery Co., at Trenton, N. J., was recently dam aged to the extent of $3,500, by the recent flood in the Delaware River.

The works of the Monument Pottery Co., of Trenton, has been sold to the Wolff Manufacturing Co., of Chicago. The new company has been in consultation for some time with W. W. Slack, an architect of that city for extensive buildings to be built to the works. The arrangements have not been completed as yet, but the matter will be closed up within a few days. Representatives of the Chicago concern have been in Trenton for the past few days looking after affairs pertaining to the facory and looking afer the proposed improvements.

The pottery of Patterson Bros., at Wellsville, O., was recently partially destroyed by fire, entailing a total loss of $8,000, including losses on bisque and glost ware and the burned buildings. Only a small portion of the plant was burned.

The factory of the J. B. Owens Pottery Co. which was recently burned at Zanesville, O., will be rebuilt at once, and it is probable with increased capacity.

The new plant of the Trenton Porcelain Co. has commenced operations in the slip-house and clay-shops and it is probable that the clay-workers will begin operations within the next few days.

The L. W. Camp Co., of Akron, O., has been incorporated with a capital stock of $100,000. The incorporators are R. E. Armstrong, L. W. Camp, Grace Armstrong, and Amelia Camp. The company will let contracts at once for the erection of an immense clay manufacturing plant.

The Monument Pottery Co., of Trenton, N. J., has just let contracts for a $70,000 addition to the present works.

Contracts have been let for the erection of eight 30-ft. kilns at the new works of the Beaver Valley Brick & Clay Co., at New Galilee, Pa. The company has secured excellent clay beds at the new location.

The Trenton Potteries Co., at the same city, has also let contracts for an addition to cost over $2,000.

The Geneva Hill Brick Works will begin the erection at once of four new brick kilns which will just about double the present capacity. The plant is owned by Harry Wilcox.

It is stated that the Globe Fire Brick Works has been sold. The business was formerly owned by James, Burnet and Fred'k Porter. It is said that it is the intention of the new owners to increase the capacity at once.

The East End Brick Works, at East End, East Liverpool, Ohio, started up last week with greatly increased capacity. The owners, Messrs. Gamble and Surles, have almost rebuilt the works, since buying same some twelve months since. They have erected modern kilns in place of the old fashioned ones that were there before. They have also installed a complete new drying system which is of their own design and build.

Three new kilns have just been completed at the Great Western Works of the American Sewer Pipe Works, at Toronto, O. This will make the Great Western the largest of the Ohio Valley Works.

Great improvements are to be made at the Knowles, Taylor and Anderson Works of the American Sewer Pipe Co., at East End, East Liverpool, Ohio. A new engine of large horse power is to be installed. The machine will be capable of developing 250 h. p.

To Fight Fires.

Among the devices for checking damage through fire by means of portable extinguishers which can be used on the spot when a blaze is in its infancy, the "Utica" chemical extinguisher has achieved an enviable reputation. The body is made of cold rolled copper, heavily coated with lead wherever exposed to the action of the chemicals, and is designed to withstand a pressure of 350 lb. per sq. in. The acid bottle, containing sulphuric acid, is confined in shield-like solid hanger made of pure lead, the part without holes being opposite the nozzle, so that the acid cannot escape until it is thoroughly mixed with the other chemicals. The lead holder for the acid bottle is one of the patented features of this extinguisher on which great stress is laid by the maker; the hanger being of pure lead is not affected by the acid and is therefore durable. In connection with the hanger there is a practical graduated feed for the acid which ensures a uniform pressure and steam when the device is in action.

The extinguisher is always ready for immediate use, it only being necessary to turn it bottom side up and direct the issuing steam at the base of the flame. No new parts are needed for reloading.

The Utica extinguisher is made by the O. J. Childs Co., of Utica, N. Y., has been widely adopted by hospitals and other public institutions.

The Purington Paving Brick Co., of Galesburg, Ill., has certified to an increase in capital from $500,000 to $600,000.

Grant & Jennings, of Elliott, Ia., have leased the brickyards at Griswold, which they will operate in addition to their plant at Elliott.

Pacific Coast Letter.

It is generally understood that the brick combine has been prolonged temporarily. At all events the price of brick did not drop on April 1st as had been predicted. It is now alleged that the old agreement will continue in force until June.

There is a good deal of activity just at present among the labor unions connected with the brick trade. Unions have been organized and are still being organized in the larger towns of the state. An agitation has also been begun against the employing of Chinese in the various brick-yards. Taken altogether the situation is not of the best and it is feared that this agitation will result in trouble sooner or later. Unless something of this sort happens or some other large strike occurs to tie up the building trades of this city, the present year will probably be the largest from a brick point of view, that the city has ever experienced.

The Brickhandlers' Protective & Benevolent Union of California was incorporated here this week. The principal place of business is San Francisco and the directors are J. Thompson, M. Wogelins, A. G. Thompson, N. C. Jensen and P. J. Peterson. There is no capital stock.

The Board of Public Works of this city has now completed its estimate for proposed street improvement. The total estimate of the amount to be expended for new sewer work amounts to $509,060; for basalt block pavement, $86,570; for re-surfacing bituminous pavements, $20,000; for reconstructing plank roadways, $15,230; new culverts, about $9,000; and 24 streets already accepted, which are recommended to be repaved will cost $297,164. No mention is made of using brick pavements, although a movement in that direction was made by a number of San Francisco merchants some time ago. The total estimates for street improvements amount to more than a million dollars. It is generally believed that this will have to be cut down considerably.

The Vitrified Brick & Tile Co., Ltd., completed its organization at Boise, Idaho, on April 10th, and elected officers as follows: President, W. N. Northrop; vice-president, J. W. Eagleson; secretary, W. A Davenport; treasurer, Wm Simons, and superintendent, F. E. Glazier. The plant of the company will be located in Slaughterhouse Gulch, near the clay bank, which the company has just purchased. It has been estimated by a clay expert that from the bank enough clay has been secured to manufacture 180,000,000 brick. J. E. Ballou, representative of C. W. Raymond & Co. of Dayton, O., has been very active in locating desirable clay and in getting the company organized. He has been given the contract to plan the building for the plant and will also furnish the machinery. The capacity of the plant will be 35,000 common brick per day or 25,000 vitrified brick. The plant will also be equipped to produce in addition to common and vitrified or paving brick, sidewalk brick, fire, ornamental building and hollow brick, fire proofing and drain tile. If the clay proves to be suitable for the manufacture of sewer pipe, a sewer pipe equipment will also be put in. The company organized with a capital stock of $75,000, and is composed of energetic men, who will push the plant to an early completion. The articles of incorporation have been filed. The principal place of business will be Boise, Idaho.

H. A. Giddings, a brick manufacturer at Ventura, Cal., has ordered a new brick-making machine from Chicago, with a capacity of 17,000 bricks a day. Mr. Giddings intends to burn a kiln of 400,000 brick at once, using oil instead of wood for fuel. He expects to begin making brick again about May 1st.

Raine & Son, proprietors of the tile factory at Wintersburg, Cal., report a rushing business. They have orders enough ahead to keep the plant in operation for several months and additional orders are constantly coming in. The dies for moulding hollow building brick have been ordered from the East. As soon as they arrive the manufacture of this material will be commenced, as the manufacturers expect that this product will be extensively used in the future. Other improvements now under way at the factory include the erection of a large drying shed in addition to those now in use, as the increased capacity of the plant will require more drying sheds to hold the output.

San Bernardina, Cal., promises soon to be the scene of a friendly rivalry between two brick making firms, both of which are now preparing to enter the market there. The competing firms will be the Taylor Bros., of Redlands, Cal., and the San Bernardino Pressed Brick & Terra Cotta Co., the latter being a new company formed a few weeks ago. Its capital stock is $25,000. Taylor Bros. have purchased from Mrs. Jane M. Goodcell the brick yard on South G St., which has long been known as Goodcell's brick yard, and the San Bernardino Co. has purchased five acres of clay ground on the corner of Eighth and I Streets, and has secured an option on five acres more opposite the property purchased by Taylor Bros. Both firms are much encouraged by the outlook for the year. There will be no slashing of prices, as representatives of both firms say that the locality is able to use more than twice the amount of brick both yards will turn out.

Volkam & Jencke have moved their entire brick making plant at Montalvo, Cal., to their new yard and are about ready to commence operations. The capacity will be about 25,000 bricks per day.

Hull's Gulch brick manufacturing plant, at Boise, Idaho, which was formerly owned by Bert Haines, has recently been purchased by H. F. Spieler, the proprietor of a grocery store in Boise. Mr. Spieler has secured the services of E. Leslie, an experienced brick-maker, who will have charge of the yard and personally superintend the manufacturing of the brick. There is a fine quality of clay near the yard, which is finely equipped. The output will be about 10,000 bricks per day.

A brick yard is to be established at Roswell, New Mexico.

The co-partnership between James H. Hornsby, T. R. Ellerbeck, James E. Clinton and Wm. L. Ellerbeck, doing business at Salt Lake, Utah, under the firm name of Hornsby & Co., as manufacturers of fire clay products, has been dissolved by mutual consent of all concerned. The business will be continued by James H. Hornsby.

The Reno Pressed Brick Co., at Reno, Nev., reports orders ahead to keep the plant running for three months. The indications are that the demand for brick this season at Reno and vicinity will be greater than the supply. Four yards will be operated at Reno.

H. P. Whartenby and others, of Everett, Wash., are incorporating a company to establish a pressed brick plant there. They have secured the services of a practical brick-maker from Boise City, Idaho, and have placed their orders for modern brick-making machinery.

Amos Ashpy has established a large brick yard just north of the town of Santa Rosa, New Mexico. He will also manufacture lime.

The new brick kiln at McNear's brickyard at Point Pedro, near San Rafael, Cal., was put into operation a few weeks ago. The work of turning out bricks was continued all winter and there are now several thousand green bricks at the yard waiting to be burned.

The Kern County Brick & Contract Co., at Kern City, opened its works on April 3d. The works were shut down through the winter, but the weather is now warm enough to resume work. The yards are running to their full capacity.

George Smith, a brick manufacturer at Mountain Home, Idaho, reports the sale of 150,000 brick to the Idaho Beet Sugar Co.

N. C. Stacy has purchased an interest in the Duquoin (Ill.) Dry Pressed Brick.

B. F. Rayse has purchased new machinery for his brickyard at Portsmouth, O., and will turn out 10,000 brick per day.

New York Letter.

The trade has no brighter prospects in years than this spring. The amount of building going on through the state is larger than usual and prices remain good. The only trouble now is that everything is coming in a rush. Buyers held off during the winter, thinking that prices would get lower, but they were disappointed. It has usually been the case that prices would go down in the winter, and then buyers could fill up. This would ease the spring trade. Such has not been the case this season. Prices remained where they were and buyers saw that they could not secure stock at reduced prices. Then came the rush of orders and manufacturers are having all they want to do to supply the demand. The factories that closed during the winter have sold out long before this and are starting up again. They are somewhat behind in filling orders. A few plants ran all winter and they are in better shape.

C. & L. Merrick and the Onondaga Vitrified Brick Co., of Syracuse, are working on a contract to furnish 1,000,000 brick for the new Smith typewriter factory. This same company will build another factory near their old one, which will also take about the same number of brick. The Merricks also have the contract for the brick on the new Carnegie library, which is being erected. This building will cost $200,000. The New York Central railroad will build a new freight house, freight offices, roundhouses, shops at Syracuse and DeWitt and this will keep the manufacturers guessing for a time.

C. & L. Merrick are equipping their yards with a new Bechtel trucking system for handling brick and have also put in a new Freese automatic cut off.

The City of Syracuse is to build new school houses and fire engine houses, to cost in the neighborhood of $200,000. The city will be bonded and proposals will be called for in due season.

Mason & Ballard had a large green kiln of brick totally destroyed by the recent overflow of Onondago Creek. Their yards are located near the banks and were covered with water. The peculiar thing about the affair is that it was the last kiln to be made at those yards, the clay having been exhausted. These brick will be reground and made over, when the yards will be abandoned. Mr. Ballard is making preparations to start another brick yard east of the city and is putting in the Bechtel trucking system. The name of the firm will be Ballard & Son.

The Syracuse Stoneware Co. reports that trade in all kinds of fire brick, sewer pipe and stoneware is excellent. In the stoneware line it makes large quantities of jugs for small beer and drinking fountains for poultry. Prices have been high all winter and will keep up. Their agents and traveling men sell brick as far away as New England and New Jersey.

The New York Brick & Paving Co. is turning out a large amount of brick and finds a ready market for them as fast as they can be turned out.

Pack & Son are ready to begin operations. They sold out during the winter.

The Paragon Plaster Co. deals in terra cotta, vitrified sewer pipe, flue linings, front and pressed brick and cements. The company owns a large plant on the Black River, where the supply of sand is had. The plant is now being put in shape, so boats can be loaded at the opening of navigation. Seventy acres of high grade sand is owned by the concern. With the recent improvements that have been installed, a boat can be loaded in twenty minutes.

The Onondaga Pottery Co., it is rumored, will enlarge its plant. The company already has 525 hands on its payroll.

The recently organized Cortland Corundum Wheel Co. has secured the lease of the old D., L. & W. stations, freight and passenger, and will build a new building to connect with the other two. Two large kilns of the most modern type will be put in for manufacture of wheels by the vitrified process. The company will also construct an oven for the manufacture of wheels by the silicate process.

The Granite Portland Cement Co., of Cleveland, Ohio, has purchased 1,600 acres of land near Clyde, N. Y., and will install a large cement works there, capable of producing 1,000 barrels a day and employing 200 hands. Upon this site the Duryea Cement Works were formerly located. They were burned down, but were not rebuilt.

Saving Cents Make Dollars.

The Wellington Machine Co., of Wellington, O., has received a letter from the Kessler Brick & Sewer Pipe Works, of Helena, Mont., explaining the accompanying illustration. The Kessler company says: "We inclose a photograph showing one of our men wheeling one of your roller-bearing brick barrows, which we had built specially to order by you. You will see that we now wheel 120 brick whereas we could only wheel 100 before. The

A MONEY-SAVING BARROW.

men wheel 120 brick just as easily as they did the 100 without the roller-bearing. Therefore, each man wheels about 1,200 more brick to the kiln each day, making an actual saving of about 40 cents per day. This means a saving of about $45 per season for every wheel barrow we have your roller-bearings on."

It is not necessary to comment on this except to note that brick manufacturers are looking for everything that saves labor in the way of machinery and tools, whereas, it used to be proverbial how extravagant many of them were, in wasting labor through not using the latest improvements. The Wellington company suggests that here is chance for all brickmakers to save enough money this season to take them to the next convention.

J. A. Steinberger, who has purchased the tile and brick plant of J. C. Houck, at Chenoa, Ill., is in the market for second hand brick and tile machinery with dies from 3½ to 18 in.; also 60-h. p. boiler and 80-h. p. engine.

New Powers in the Trade.

The American Brick & Chemical Co. has completed the installation of its new plant at Springfield, Mass.

The Sheldon (Ill.) Brick Co. has installed a new machine at its yards and resumed operations for the season.

The Liscomb Brick & Tile Co., of Liscomb, Ia., has been incorporated by J. C. Myers, S. S. Smith and D. C. Boyd.

The Wassall Clay Co., of Columbus, O., capitalized at $30,000, has been incorporated by J. M., S. S. and J. A. McDowell.

The Fulton (Mo.) Firebrick Co., capitalized at $600,000, has been incorporated by L. U. and M. E. Nickell and D. C. McCue.

The Chockyotte Brick Co., of Weldon, N. C., capitalized at $10,000, has been granted a charter. C. J. Rhem is interested.

The Sioux Falls (S. D.) Brick Co. has been incorporated with $50,000 capital stock by E. L. Smith, S. L. Tate and R. A. Wyman.

The Illinois Brick & Tile Co., of South Litchfield, Ill., capitalized at $22,000, has been incorporated by D., B. K. and R. Davis.

The Bartonville (Ill.) Brick Co. has been incorporated with a capital stock of $2,500 by Devere Shall, John Kay and Joseph W. Maple.

The Brookside Brick Co. of Cleveland, O., capitalized at $25,000, has been incorporated and will open a brickyard in the suburbs of Cleveland.

The Armstrong Brick & Tile Co., of Armstrong, Ia., capitalized at $10,000, has been incorporated by William Sheart, G. W. Umphrey and John Dows.

The Los Angeles (Cal.) Pressed Brick & Terra Cotta Co., of which Charles H. Frost is president, has applied for a permit to maintain a brickyard.

The Eagle Pressed Brick Co. of Huron, S. D., has been incorporated with a capital stock of $50,000 by F. R. Covert, D. B. Sweester and Philip Lawrence.

The F. A. Hyde Tiling Co., Peekskill, N. Y., has been incorporated with a capital stock of $10,000. H. C. Hyde, T. J. Powers and W. S. Jordan, Peekskill, directors.

A Barr, a brickmaker of Sheldon, Ill., has made a number of improvements at his yards and begins operations this year with a considerably increased capacity.

The Louisville (Ky.) Brick Co., capitalized at $35,000, has been incorporated to manufacture and deal in brick. J. G. Nevin and M. J. Bannon, of Louisville, are interested.

The Standard Brick Co., of Los Angeles, Cal., has been incorporated with a capital stock of $25,000 subscribed in full. W. Gillelin, R. W. Kenny and H. W. Simons are among the directors.

The Blackford Clay Co., of Owensboro, Ky., has been incorporated with $5,000 capital stock by J. G. Stuart, Dr. W. F. Storman and Camden Riley. The company will mine coal and manufacture pottery.

The Kruse Brick Co., of Dowagiac, Mich., has been incorporated with $10,000 capital and expects to open a brickyard with a capacity of 1,000,000 brick per season. William White is president of the company.

The Kelly Infusible Clay Co., which owns and will develop 100 acres of clay lands near Halliday, Pa., has opened executive offices at 119 South Tioga St., Ithaca, N. Y. R. G. Tucker, of Ithaca, is principally interested.

The old sewer pipe works at Tallmadge, O., formerly owned by H. B. Sperry, have been purchased by Messrs. Akers & Harpham for $10,000 and will be renovated and again put in operation, under the title of the Akron Vitrified Clay Works.

The Lafayette (La.) Brick & Tile Manufacturing Co. has been organized with $25,000 capital stock and the following officers: C. O. Mouton, president; J. A. Roy, vice-president; Louis Lacost, secretary, and W. G. Mouton, general manager.

The Epping Brick Co., of Boston, Mass., has been incorporated with a capital stock of $100,000 for the purpose of manufacturing brick, tile and pipe. The officers of the company are: William T. Eaton, of Boston, president, and Frederick Lovis, of Boston, treasurer.

The Beaver Clay Manufacturing Co., of Beaver Falls, Pa., proposing to erect a plant for the manufacture of fire-brick, building and enameled brick at New Galilee, has applied for a charter. Louis and Frederick Davidson, and Eugene S. Hoopes are interested.

The Monongahela Valley Brick Co. is being organized by Pittsburg, Pa., capitalists, and will apply for a charter. The company is capitalized at $50,000. Its officers will be: Joseph McK. Speer, president; J. R. Taylor, vice-president, and J. R. Speer, secretary and treasurer.

The Speer Clay Manufacturing Co. of Vanport, O., capitalized at $100,000, has effected its organization, and has purchased the business and plant of the Douglass-Whifler Brick Works. The new owners will enlarge and improve the plant for the manufacture of terra cotta and Roman building brick.

The Ohio Brick Supply Co., Toledo, O., with a capital stock of $50,000 all of which is paid in, has been incorporated to build a large steam brick plant near Toledo, to have a capacity of 40,000 brick per day. A. L. Kuhlmann, Richard Kind, George Metzgar and P. H. and J. P. Degnan are interested.

The Mount Clemens (Mich.) Brick & Tile Co., capitalized at $20,000, has been incorporated with the following officers: William Nank, president; T. Van Damme, vice-president; and Benjamin Lemme, secretary and treasurer. The company has purchased the Cadow and the Nank brickyards in Mount Clemens and will enlarge and improve them.

The Duquesne Fireproofing Co., comprising a number of Pittsburg, Pa., capitalists, among whom are George H. Albertson, E. J. Frauenheim and A. W. Duff, will apply for a charter to build an extensive fireproofing plant at West Winfield, Pa In addition to fireproofing the company will manufacture sewer pipe, brick and other clay products. The proposed plant will have a capacity 40,000 brick a day. Offices will be opened in the Tradesman's Building, Pittsburg.

The Perry (Ia.) Brick & Tile Co., capitalized at $5,000, has filed articles of incorporation.

The Cherryvale (Kan.) Pressed Brick Co. has been incorporated with a capital stock of $30,000.

The Rocky Mount Brick Co., Norfolk, Va., has been incorporated with a capital stock of $20,000.

The Crown Potteries Co., of Evansville, Ind., has been incorporated with $400,000 capital stock.

The B. & K. Enameled Brick Co., of Cleveland, O., has been incorporated with $60,000 capital stock.

The Avoca (Neb.) Pressed Brick Co. has been incorporated by Hermann Seiffert and others, with a capital of $15,000.

The Belleville (Ill.) Brick Co. has been incorporated with $60,000 capital stock by J. A. and L. E. Day and Edward Abend.

The Maryland Art, Brick & Tile Co., of Belair, Md., has been incorporated with a capital stock of $300,000 to manufacture brick and tile.

The Southern Firebrick & Clay Co., Chicago, capitalized at $100,000, has been incorporated by M. P. Breen, R. J. Barry and L. F. Chapman.

The Palmer Pressed Brick Works Co., of Palmer, Tex., has been incorporated with $20,000 capital stock by R. Smith, J. M. Blocker and C. F. Love.

The South Milwaukee Brick Co., Milwaukee, Wis., has been incorporated with $10,000 capital stock by William and B. Haertel and Charles Westphal.

The Rochester (Pa.) Clay Pot Co., capitalized at $15,000, has been incorporated by Albert Hamilton, James P. Kerr and John McClaren, of Pittsburg.

The Richmond Brick Co., of San Francisco, has been incorated with $100,000 capital stock. Jacob Stern, J. E. Cary and E. A. Vining are directors.

The Colorado Brick & Artificial Stone Co., of Colorado Springs, capitalized at $150,000, has been incorporated by E. E. Wade, J. I. Franklin and F. E. Brooks.

The Enamel Brick Co., Dover Del. has been incorporated with a capital of $60,000 by E. C. and L. Kelly, of Cleveland, and J. L. Blackburn, of Warren, O.

The Akron (O.) Roofing Tile Co., capitalized at $105,000, has been incorporated by Charles E. Howland, H. M. Hollinger, W. B. Collins and Harvey Musser.

The Texas Pressed Brick Co., of Mexica, Limestone County, Tex., has been incorporated with a capital stock of $20,000 by J. M. Long, J. Nussbaum and M. E. Roberts.

The Jefferson County Brick Co., of Louisville, Ky., has been organized by Harry T. Weaver, of that city, and will erect a plant for the manufacture of cherry red brick.

The Anthony Ittner Brick Co., of Illinois, has been incorporated. An office will be opened in St. Louis, and half of the company's capital of $100,000 will be employed in Missouri.

The Corneer Brothers & Croft Brick Co., of Omaha, has been granted a charter with a capital stock of $10,000. Samuel and Edward Corneer and Henry Croft are interested.

The San Bernardino (Cal.) Pressed Brick & Terra Cotta Co. has applied for incorporation with $25,000 capital stock (subscribed) and proposes to erect a plant at a cost of $10,000.

The Champion Clay Co., capitalized at $50,000, has applied for incorporation, projecting a brick manufactory near East Liverpool. O. T. H. Silver, of Wellsburg, is principally interested.

The Saginaw (Mich.) Sandstone Brick Co. has perfected its organization with J. L. Jackson, president, and H. D. Norris, secretary, to manufacture sandstone brick by the Komnick system.

The Speer Clay Manufacturing Co., of Pittsburg, has been incorporated with a capital stock of $10,000. J. R. and Joseph M. Speer, of Pittsburg, and Clyde Brooks, of Imgram, are directors.

The New Jersey Mosaic Tile Co., of Matawan, has been incorporated with $50,000 capital stock by Karl Matheasen, of Plainfield; E. V. Eskesen, of Perth Amboy, and B. K. Eskesen, of Matawan.

The United States Sewer Pipe Co., of Pittsburg, Pa., with a present capitalization of $1,000, has been incorporated. The directors of the company are: H. L. Castle, Frank Jarvis and A. H. Meyer, of Pittsburg.

The Burns & O'Shea Brick Co., Detroit, Mich., capitalized at $30,000, has filed articles of association and will erect an extensive brick plant near Detroit. James D. and Timothy Burns, and Simon O'Shea are interested.

The Thomaston (Me.) Face & Ornamental Brick Co. has been incorporated with a capital stock of $220,000, of which $12,020 is paid in, to manufacture front, face, paving and common brick, and roofing and drain tile. Thomas A. Carr, president.

The Sergeant Bluffs (Ia.) Brick Co. has been organized to reopen the old Sioux City and Sergeant Bluffs brickyards which have been closed for nearly six years. C. W. Ritz, postmaster at Sergeant Bluffs, is principally interested in the new company.

The Chicago Lenzburg Coal Co., of Lenzburg, Ill., has been incorporated with $100,000 capital stock to mine coal and clay, and manufacture brick and other clay products. The incorporators are: D. D. Thomas, William Casperson and F. M. Vernor.

The Eureka Brick Association of Grand Rapids, Mich., has been organized with Captain H. N. Wilder, of Grand Rapids, president, and A. H. Brown, of Traverse City, Mich., secretary, and is installing a plant which will have a daily capacity of 80,000 brick.

The Doniphan (Neb.) Brick Co. is meeting with a large demand for last season's product.

The Bartholomew brickyards at Grand Forks, N. D., have been sold by J. M. Bartholomew to A. I. Hunter. The sale includes one of the largest brick plants in the state and a quarter section of land.

The Clark Pressed Brick Works, Malvern, Ark.

The clay products of Arkansas are steadily on the increase in number and variety and among the leading companies engaged in their manufacture may be mentioned the Clark Pressed Brick Works, of Malvern, Ark. This plant is situated on the Iron Mountain Railroad about a quarter of a mile from Malvern. The grounds owned by the company cover over 100 acres. The main building of the plant is a frame structure 80x60 ft. and two stories high with a boiler room 40x30 ft. constructed of brick and attached to the main building. All the buildings are covered with fireproof roofing. A very important building to the plant is the clay shed, which has an extraordinary capacity, being 200 ft. long and 80 ft. wide. The great advantage of this large-sized shed is that by the quantity of clay that it will hold it is possible to run the works the whole year through. The clay is of a fat nature, gray in color streaked with white. It is used direct from the bank without any weathering and is plowed. It is then conveyed by wheeled scrapers to the cars of the company's own make and brought to the press on a truck. The depth of the clay bank varies from 10 to 12 ft. The clay is tempered in a horizontal pugmill manufactured by the Wallace Manufacturing Co., of Frankfort, Ind. There is also a Frost dry pan in operation. The clay is molded into stiff-mud or dry-press building brick according to the needs of the market and when burned is of a beautiful red color. The stiff-mud bricks are made on a "Little Wonder" and are end-cut with an automatic cutting table with a capacity of 30,000. Two powerful Chisholm, Boyd & White dry presses, of 20,000 daily capacity each, are used

S. A. WILLIAMS.

THE CLARK PRESSED BRICK WORKS, MALVERN, ARK.

to manufacture dry pressed brick. Both the stiff-mud and dry-pressed bricks are loaded in double-deck drier cars which convey them to a 10-track steam drier erected by the Standard Dry Kiln Co., of Indianapolis, Ind. The drier is heated by exhaust steam and dries the brick thoroughly in 36 hours.

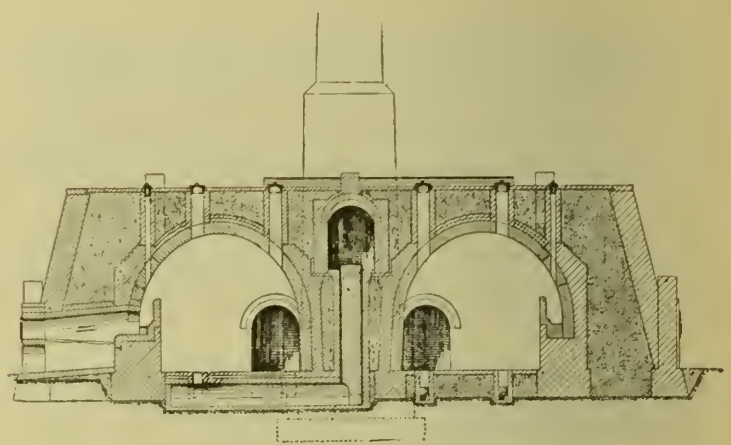
From the drier the green bricks are conveyed to the kilns which are four in number, being Swift's patent up-draft kilns with a capacity of 360,000 each. The brick are set in the kilns 3 over 3 and for watersmoking the kilns are charged with coal every 24 hours for 3 days, when the heat is then allowed to rise. Coal is used as fuel, and from 90 to 100 tons are required per kiln. The Swift kilns are giving satisfaction, as are also the machines. Burning is usually effected in about 8 days.

The boiler house contains a 75 h. p. Atlas engine and two 100 h. p. boilers and about 100 lb. steam pressure is maintained each run. The boilers are also made by the Atlas Manufacturing Co.

The capacity of the plant is about 60,000 daily and the products are common building, fine pressed and fire brick. The plant gives employment to from 35 to 40 men. The officers of the company are Louis Meyer, manager; Charles Brien, who has special charge of the burning, and S. A. Williams, superintendent. The plant is owned by C. W. Clark and T. Johnson, of Little Rock, Ark. Mr. Clark is an extensive contractor and keeps the plant running steadily for his own use.

Combination Continuous Kilns.

The accompanying illustration shows one of the Wuerz & Kottenhagen combination continuous kilns, which can be fired in three



A GOOD COMBINATION CONTINUOUS KILN.

different ways. The old and well-known strew feeding may be used for common brick or the side drop shaft firing for pressed brick, and there are also grates at the sides and these may be fired much the same as in a down-draft kiln. This flexibility gives the brickmaker the advantage of being able to burn a great variety of wares in the same kiln, by using in each chamber as it is taken on the method of firing best suited to the ware contained in it. Each compartment is fired independently.

This kiln is said to be specially adapted for districts where wood is the cheapest fuel, as wood can be used in it with success.

Wuerz & Kottenhagen write us that the prospects for the building of Hoffman kilns for which they are American, Canadian and Mexican agents, and other kilns for which they control patents, are very bright. They report numerous inquiries and two orders as the result as a "Brick" advertisement for one month.

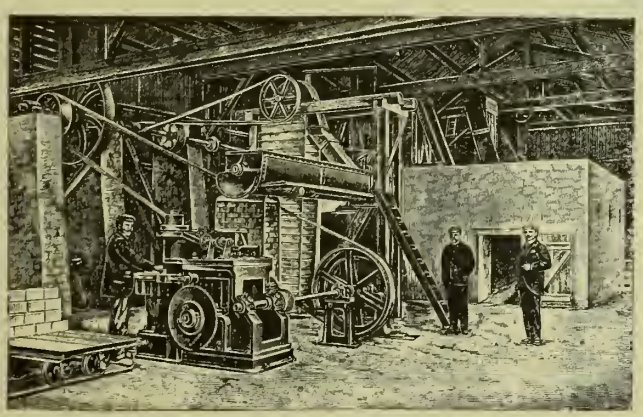
The Benton Harbor (Mich.) Brick & Tile Co. has begun extensive improvements at its plant, proposing to erect several new sheds and install new machinery. On April 1st the company will increase its force from 25 to 60 men. J. J. Miller is manager of the company.

The Huennekes System.

The "Huennekes system" is a method of making building bricks out of sand and lime. We have noticed in months past the development of this system in Germany and now in the United States it seems to be obtaining a firm foothold. It is claimed that brick manufactured by this system are considerably cheaper in price, can be used for all kinds of construction, leading thus to great diversity in shape and colors, and they can be made equally as well in winter as well as summer. The brick is composed of from 94 to 96 parts of sand and 4 or 6 parts of lime. The lime is ground in a pulverizing mill, from which it passes into an apparatus which measures out the required proportions of lime and sand, the latter material being simultaneously brought into another part of the apparatus. This material meter is adjustable to any proportion desired. From here the sand and lime thus measured off fall into a mixing apparatus where they are thoroughly ground together. The mixed material is carried by an elevator wherever it is desired and the mixture is pressed into bricks in a press especially constructed for the purpose. The pressed brick are then put on iron cars which, when loaded, are run into a long iron cylinder fitted with rails. This cylinder, varying in size, holds from 10,000 to 20,000 bricks. It is next hermetically sealed and the contents subjected to the direct action of high pressure steam chemically charged. The object of this is to effect a combination of the hydrated lime and silicic acid of the sand forming a silicate of lime which gives the brick hardness and weatherproof properties. Two cylinders are used and when the bricks in one cylinder have undergone the action of the steam for 10 or 12 hours the steam is turned into the second hardening cylinder, which has been filled with other brick in the meanwhile, and the first bricks are ready for use.

The utmost secrecy is observed by the patentees of this system as regards certain parts of manufacture. Nearly every kind of sand is considered suitable for the manufacture of sand bricks—sea sand as well as the common quarry sand, the best quality being the rather fine sand with sharp edges. The purest lime is best adapted for the purpose. The granulated scoriae from blast furnaces may also be used in lieu of sand.

Tests have been made by the Pittsburg Testing Laboratory, Pittsburg, Pa., showing the crushing strength to be from 3,518 lb. to 4,162 lb. per square inch; the absorption test from 8.57 per cent to

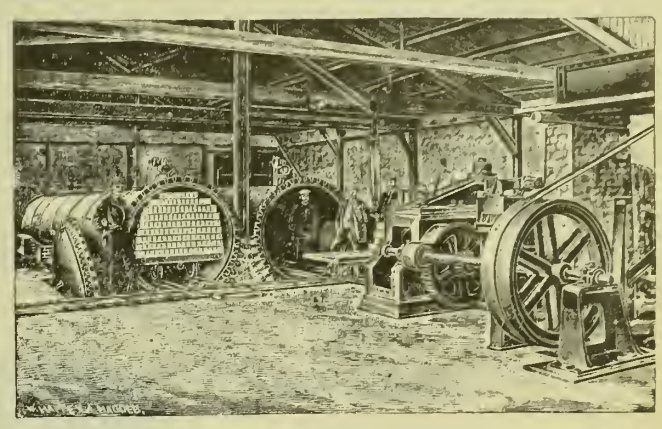


THE SILICATE BRICK PRESS.

11.6 per cent after 45 hours immersion, and from 8.8 per cent to 12.4 per cent for absorption after the freezing tests; the freezing tests were satisfactory, and in a fusion test in an electrical furnace the bricks have stood over 4,000 degrees F. without melting.

The catalog of Huennekes & Co., from which these data are taken contains an exhaustive description of all the different tests made, which would indicate a high quality for the brick. The size of the Huennekes brick is 2½ x 4¾ x 10 in.

As regards the cost of production the following estimate is pre-



THE DRYING CYLINDERS.

sented in the catalog in table form, enabling the intending purchaser to work out for himself the cost per M under local conditions.

	Cost.
9 workmen	$
2 tons of coal	
2½ tons of lime	
Lubricating stuffs	0.75
Depreciation	3.00
Chemicals	1.00
Total	$ .00

The machinery appliances for a factory with a capacity of 15,000 bricks per day are said to cost about $14,000. A plant for the manufacture of silicate bricks by this system is already in operation in Michigan City, the Olmacher Brick Co., another plant is nearing completion in Florida, yet another in North Carolina and a large plant is being established near San Francisco. Truly the era of the sand brick seems to be dawning.

Vacation Trips.

Do you expect to treat yourself to a vacation trip this summer? If so, write for a copy of Wabash Summer Tour Book, giving a great variety of attractive tours with cost of tickets and other valuable information. Write us about any trip you may have in mind. It's our business to help those who travel.

F. A. Palmer, A. G. P. A.,
97 Adams St., Chicago, Ill.

R. G. Eisenhast, proprietor of the Horseheads Brick Works, Ithaca, N. Y., has improved and extended his plant and begins this season's operations with an increased capacity.

Henry Wilcox, of New Brighton, Pa., has leased a site for a brickyard at Beaver Falls, and purchased an 80-h. p. engine and other machinery. Operations will be begun this season.

The Timmerman Jug Co. has been organized at Stockton, Ga., and is engaged manufacturing all kinds of ware, particularly jugs, jars and flower pots. The company is a leader in fine ware in southern Georgia.

New Bifurcated Machine.

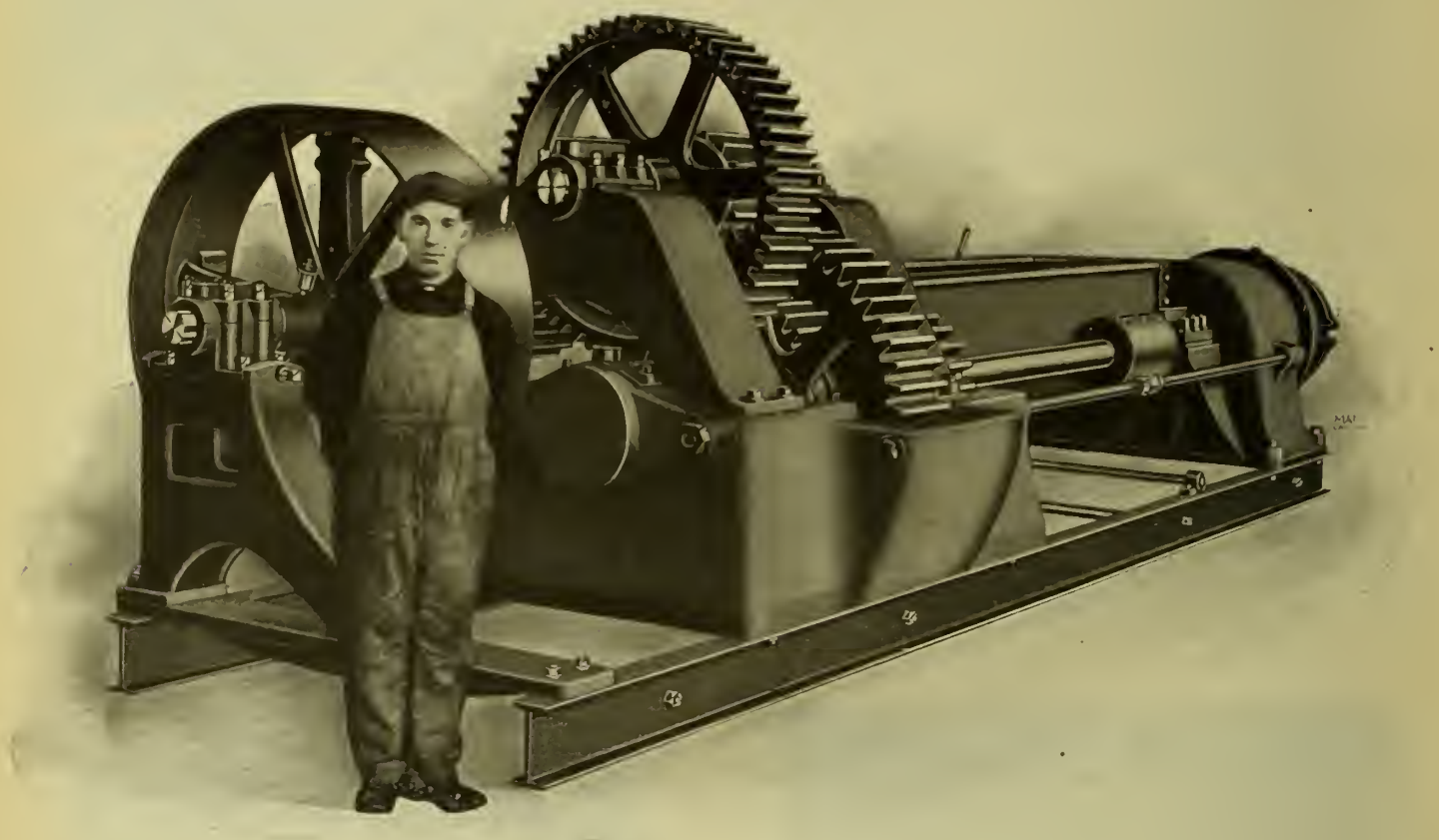
A perusal of the gorgeous catalog issued by the American Clayworking Machinery Co. would prepare the clayworker visiting the company's shops at Bucyrus, O., for a scene of great activity but the visit will convince him that the anticipation was far below its realization. In Bucyrus is undoubtedly not only one of the largest concerns in the world devoted to the manufacture of clay-working machinery, but it is also one of the most progressive and employs the latest and most modern shop practices and methods with the most modern equipment. The company employs the best talent obtainable and systematizes the work so that every branch and department receives special care and attention. Ever ready to adopt possible improvements or bring out new machinery the company is deserving of the large business it has built up.

The accompanying illustration shows one of the company's latest products in new machinery, which has been designated as No. 23. This machine will appeal to the observer because of its symmetrical design, strength, convenience and capability. It is of the bifurcated type but differs from other combination machines in that the mixing cylinder and expressing cylinder are side by side instead of one being above the other. By this construction the clay is forced by pressure from the mixing cylinder into the expressing cylinder. In other styles of combined machines the clay falls by gravity from the mixing cylinder through a throat to the expressing cylinder. This new method is believed to be a vast improvement as it prevents the choking of the clay in the opening between the two cylinders and makes it possible to work either stiff or soft clay without its barreling up the wipers, and permits a greater variety of clays to be worked.

By placing the cylinders side by side 4 ft. in height is saved, which permits of a lower building and makes a saving in cost in this and in the shorter elevators required. It also places the operator on the same floor as the machine and cutter, doing away with the elevated platform which has heretofore been necessary; this is an important point.

All parts have been designed with a large factor of safety and particular attention has been paid to accessibility of all parts. The machine is mounted on I-beams and is built in three sizes which range in capacity from 35,000 to 100,000 brick in ten hours. The gearing is particularly strong and well placed. The bearings are long and all of them are out of the mud. The end thrust is amply provided for and the oiling devices are perfect. This machine is equipped with friction clutch pulley and as shown weighs 25,000 pounds.

The American Clayworking Machinery Co. will be pleased to furnish a full description on application.



THE NEW BIFURCATED MACHINE.

The Newbern (Ill.) Brick Co. will build four additional kilns.

Charles Carman, of Hamburg, Ia., has installed new machinery to the amount of $1,500 in his Hamburg brick plant.

B. F. Earl, of Niles, Mich., contemplates erecting a brick plant to develop 40 acres of clay land which he owns at Niles.

The Hanover (O.) Pressed Brick Co., and the Oakland Pressed Brick Co., of Zanesville, have opened offices in Columbus.

The Standard Brick & Stone Works, McClainsville, W. Va., has just installed a new 120-h. p. engine. New kilns are being built which will give the company an average output of 50,000 brick per day, and a maximum capacity of 60,000.

TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY

REPRINT FROM VOL. III OF THE "TRANSACTIONS OF THE AMERICAN CERAMIC SOCIETY 1901"

The Use of Glazed Clay-Ware as an Architectural Decoration in Exterior vs. Interior Work.

BY OTTO HENSEL.

If you expect anything comprehensive, I must disappoint you at the outset. At present I am able to give but a few disconnected observations on the theme, whose immensity I discovered only on trying to write about it. Everything that is excellent in glazes is embraced, and its mastery requires a good deal of concentrated study.

Nevertheless, let a person but start in finding shades for decorative effect, and he is at once confounded by the problem with all its mysteries. Merely to duplicate a glaze is simple enough, yet frequently the problem is to vary existing or find new effects. Frequently the experimenter must ask and answer himself, "What feature makes this glaze valuable for that purpose?" However mean his ability, he has to meet the subject as squarely as the greatest master of the craft. It is necessity spurring him on, over again.

The subject divides itself into decoration of the interior, of the exterior walls, and of the roof. Effects must be studied by the laws of color as laid down in good manuals on chromatics and by those governing the art of building as found in works on architecture. Above all these aids, the student must command a share of good taste and of a healthy critical faculty, and cultivate them. Furthermore, he can only hope to make progress by the study of concrete examples, actual architecture surrounding him. Chicago is a fertile field for such work.

You will perhaps tell me that this is an unpractical scheme leading nowhere; that tastes are as numerous as individuals; and that in practical work, one must give what is called for. Still a study of the truths underlying the art will give the student his bearings, and he is then free to put his cleverness to the test in meeting exigencies of the moment and perhaps bringing a new contribution to the art.

Interior effects in the broadest sense may be taken to include all pottery from porcelain to terra-cotta articles. But then, articles of the coarser sort, such as majolica vases, are just as effective out of doors, provided they are placed on a level with the eye or below it, to enliven a corner of the piazza or of the lawn. Interior effects proper refer to mosaic floors, tiling for walls, and ceiling decoration.

The glaze has a distinct purpose here, according to established laws of chromatics and of architecture. The checkered floor emphasizes the spaciousness of the room and the walls give character to it in keeping with its intended use; the ceiling seems to be partly independent of the rest, for its decoration, while depending on the wall, diverges from it.

The effects desired appear to be obtained mainly in three ways, underglaze, which may be strengthened or altered by color in the glaze, colored tin enamels, and transparent or colored glazes over relief, where the varying thickness of the overlying glazes produces light and shade. What is desirable here seems to be either a strong metallic reflection especially suitable for back ground, or a great depth of lustre combined with play of colors. The chemist works in a very complicated fashion, applying freely colored englobes, variously colored clays laid side by side, a great deal of fritt for perfecting lustre, specially prepared colors, and the like.

Decorative effects on the exterior walls are becoming very frequent. Our technical periodicals state that we are entering an epoch in architecture showing a distinctly picturesque tendency; that we demand no neutral tints but bold general effects and harmony of color. I do not venture to state to what extent the effects prevailing for the interior can be utilized here. I have seen little in that line. Several small store-fronts with the narrow strips of walls left beyond the window spaces, laid with richly glazed brick in mosaic pattern, may be classed, I suppose, with what Ruskin styles "commercial art." I saw one church, of broad, tent-like outline and severe style of architecture, of glossy white, though no particularly offensive lustre—a significant departure. I noted that matt surfaces, flowed smooth for the sake of cleanliness, prevailed. If harmony is brown, as has been stated, I should think it might be used more, provided, of course, that a suitable attractive glaze is available. Thick and lustrous majolica glazes find a sparing use in outside decoration.

The glazing technique is much simpler. Frequently the chemist can perhaps do without fritts altogether, bringing to aid ground glass and calcium borate, a compound which forms in the raw glaze when quick-lime and boric acid in equivalent amounts are ground with the rest. These glazes are exposed to the changes of temperature the year round and therein lies a difficulty that he who compounds glazes for interior work hardly meets in his channel. Owing to nearness to the observer, the chemist must see that his colors come out clearly and properly in the glaze or englobe, hence some care is necessary in their preparation.

The roof, once decided that the house shall have one, is a separate member in architecture. It does not apologize for being there and can be treated with all the boldness consistent with the plan of the house. Unlike the wall, which may have a dark, shady street, or a grove of sombre-looking trees, or an expanse of warm, rich nature for background, the roof in our latitudes always has the same background of cold blue. Hence we find suitable either a dark intensely matt surface or warm colors. Thus it suggests massive structure or harmony of color. Owing to its distance from the observer, the coloring must be strong, no half tints. Metallic-looking enamels are out of place here. The gloss of majolica glazes may be employed, but more generally the more matt the effect, the better. It seems to me that of glossy glazes the one that contains the color suspended without being completely opacified, is much more effective than simple underglaze effects.

Although much can be learned from the more complicated departments in the art and chemistry of glazing, the greatest simplicity of procedure prevails here. The effect will be good even with a blotchy color, provided it be strong.

Discussion.

W. D. Gates: I suppose that among the many things that tend to make the sad life of the terra-cotta man sadder, and makes the nervous prostration that ultimately awaits him almost welcome, none is more appropriate than this question of exterior decoration with glaze and enamel. We have, of course, to furnish our ware as people want it, and there is a growing demand for buildings with enameled fronts, which we have to meet. One of the things which tends to hasten this nervous prostration is the fact of constant haste to pressure. You potters, in making a cup, know that no man is waiting to drink out of that cup. He has something else to drink out of, while you are working. He can use sea shells, tomato-cans and other articles. The sanitary potter need not endanger his bath tubs because a man is waiting; the man can go and dent the surface of the nearest river, if it is necessary. But when a man makes up his mind to use architectural terra-cotta in his building, then our fun begins in earnest. In the West, we have a feverishness in doing things. There is such a thing as time in some places; they have another day, down South. We haven't got it in Chicago—there is only one day. There is always that everlasting rush. If you get tied up in a contract with a forfeiture of five hundred dollars a day, and if you don't have it completed at such a time, you are "it."

Then the question of color comes in, in such a violently aggressive way. The architect has a scheme; he sees in his mind's eye what he wants, and we show him a little sample. (We can all make good samples—I always prided myself that whatever I sent to the building, I could always send good samples to the architect, and I have a poor opinion of a man who can't make good samples.) The architect must decide from that little sample as to what it will look like in large masses; then we must give it to him. Last year, one of our customers had a mania for a blue-white building, even though he had to tear down another building to get it. The next man must have a creamy white, with more life in it. Blue and white was too cold.

A dull, matt surface will not keep as clean as a polished surface, and a man will run the risk of reflected light from large surfaces, the unevenness of which will throw down the light in bucketsful. The dull surface will not do this. The troubles we have with our architect friends keep us moving. I remember straining what few nerves I had left to make a twelve-foot fluted column. I succeeded and then the architect wanted a twenty-five foot column. You often wonder at my sad appearance and drooping figure, and that is the reason.

The Chair: There is one point I have often wished to speak to architects on, and I wish there were twenty here.

They make, up at Alfred, N. Y., a very good grade of roofing tile. The architect's specifications for one of the buildings at Alfred University insisted that the tile be of uniform color. We have such a roof on one of the buildings now, and the pieces of tile are as near alike one another as sticks of sealing wax: you can't tell one from another. I think that is a mistake.

I recently had occasion to build a chicken house, and I went out to this roofing tile yard, and said that I wanted some waste tiles, and was given what I wanted from a cull-pile. I selected what I wanted and put it on, and I have the prettiest little roof in the country. It gives all the shades of clay product, as it is run from the machine; just such variations as we know in a nice red brick building. We all can recall instances of a brick building painted red, with the lines carefully penciled out in white. I can hardly describe the effect it has on me. It is an absurdity. Clay products should not be absolutely uniform; we lose all the play of light and shade in which lies one of the true values of the clay itself. So I insisted that I would not put on this uniform red tile. I went to the tile-yard once more and said that I wanted those old tile, instead of the uniform ones which the architect had specified. I found a large stock of those tiles of different shades, and got some brown trimmings, and we now have a mottled roof which is as much superior to plain, one-color roof, as gold is superior to lead. I wish that architects would take our experiences into consideration.

H. B. Skeele: I want to say that our experience bears out very fully what Mr. Binns has said regarding the growing demand for variety in color. Formerly, roofing tile was called for of a uniform shade. Now scarcely one architect in ten will call for a uniform shade. They even go so far that the natural variations of shade of the tile coming from the kiln, which is large, is not sufficient to meet the demands. On one occasion we had to make a special mixture to bring in four different shades quite widely apart, for one order, in order to get this variegated effect in the roof, which is, as has been rightly said, so much more desirable.

The Relation Between Kiln Atmosphere and the Color of Porcelain.

Mr. Griffin: I have asked to have this question put before the society, because I wanted to know more about it, not because I had anything to say. I would like some other member to tell me why it is that in burning porcelain it sometimes burns with a yellowish tinge and sometimes with a grayish tinge, the same ware. I don't pretend to know, myself.

William H. Zimmer: In regard to the influence of the kiln gases on porcelain, I would like to treat, first, of hard spar-porcelain. A kiln atmosphere can be reducing or oxidizing. The coloring matter in a porcelain body is the oxide of iron. The oxide of iron can be present as a ferric oxide, or as a ferrous compound, a silicate, which has rather a bluish white color. With ferric oxide, we get a yellowish tint. If we have a reducing atmosphere, we have all shades of white,—bluish white, grayish white, and a gray, which can actually be transformed even to a black by excessive reduction. This darkest color is due to carbon. When you get particles of carbon imbedded in your glaze, of course the black color that follows has nothing to do with iron, and is not to be referred to the iron.

If we come to the soft porcelains which bear a lead glaze, the influence of kiln atmosphere will be a little more complicated, inasmuch as the sulphur in the kiln atmosphere will have a more decided effect than on a leadless glaze. Of course, the coloring influence of oxide of iron will be just the same; you will have still the yellowish tint going over to white. But if your flame is too strongly reducing, it may reduce the lead in your glaze to little globules of metallic lead, producing a gray or blackish coloration.

Mr. Griffin: Then, do I understand that the whole thing resolves itself into the change of iron from the ferric to the ferrous condition, this change assisted by the moisture which would be in the kiln?

Dr. Zimmer: Well, moisture might have some influence; it might assist it. Moisture especially has a great deal to do with influencing color if you have sulphur in the kiln gases.

The Chair: Doesn't moisture intensify any action there, whether reducing or oxidizing?

Dr. Zimmer: Yes.

The Chair: Few men have fired white ware, who have not come across blued ware accidentally when they don't want it The first thing to learn in the remedy of a disease is to learn the cause of it. If you can produce your disease, you can cure it. Has the question been answered to your satisfaction, Mr. Griffin?

Mr. Griffin: Yes, sir.

The Swoyer Bros. Brick Co., of Allentown, Pa., have purchased a 9 ft. iron frame dry pan of the Frost Manufacturing Co., Chicago, for its new plant at Allentown.

The Plant Kiln Construction Co., of Carbon Cliff, Ill., on April 15th sold kiln rights to the Buckeye Fire Brick & Clay Co., Scioto Furnace, O., of which E. P. Stevens is president and manager.

The Jennings Brick Co., Ltd., of Jennings, La., has just installed a dry press brick machine, made by the American Clayworking Machinery Co., of Bucyrus, O. The machine has a capacity of 25,000 per day.

The New England Fire Proofing Co., of 178 Devonshire St., Boston, Mass., are busy installing the new 999 brick machine and down cut automatic cutter recently purchased of the C. W. Raymond Co., through their New York office, and expect to be running double their former capacity soon.

The Reese-Hammond Fire Brick Co., of Bolivar, Pa., in addition to the sending forth as a herald of its goods an attractive yearly calendar, has just mailed to us its quarterly calendar for May, April and June. High-Horse, a famous Sioux chief, in full accoutrement and pipe of peace, is superbly presented to the reader in halftone.

The C. W. Raymond Co., of Dayton, Ohio, are busy constructing a large consignment of brick machinery consisting of a No. 2 Daytonian, single-geared pug mill, clay separator, down-cut cutter, conveyors, line shaft, pulleys, belting &c., engine and boiler, barrows and trucks and drier equipment for 25,000 bricks per day to be shipped at an early date to Peru, South America. This equipment was sold through the efforts of their New York office, No. 39 Cortlandt St., New York City.

The April number of Graphite, issued by the Joseph Dixon Crucible Co., of Jersey City, N. J., has appeared to its readers with its usual attractive make-up. An interesting extract from an article in the London Engineer is reprinted on "Experiments on Cylinder Lubrication". There is also a speaking illustration of a wharf at New York on which are piled 753 packages of Dixon's Graphite with an aggregate weight of 105,560 lb., the whole being shipped to San Francisco.

J. C. Steele & Sons, makers of the "New South" brickmaking machinery, Statesville, N. C., report business good in their line at this season, especially in their larger machines. They are shipping outfits to Lexington, High Point, Concord, Washington, Durham, and Denver, N. C., Hollands and Lawrenceville, Va., Fort Valley, Ga., Elloree, Pickens, and Batesburg, S. C.; also 50 drier cars to Atlanta, Ga. They state they are working extra time and can't keep up with orders.

The Chicago Brick Machinery Co., 225 Dearborn St., Chicago, Ill., among the varied lines which it handles has recently included the "Norcross" patent brick lifter which it is claimed saves more than one-half the labor-cost of handling brick. The breakage in handling is reduced to a minimum and it is claimed that the work is done much better, the brick being left in an orderly pile and handling facilitated. Prices can be obtained upon application to the company. When you write mention "Brick".

The Cling-Surface Manufacturing Co. has received the following letter from the Wellington Machine Co.: "We have been using your 'Cling-Surface' in our works during the past three months with very satisfactory results. We use it in all of our belts, old and new. Formerly we were obliged to strain some of the belts so tight that the lacings would pull out. That is not necessary now, and we believe that we have increased the output of some of the machinery, especially the engine lathes, over 25 per cent. In the case of one lathe, used in turning and finishing fly-wheels, before using 'Cling-Surface' it required four hours to do the work on each one. It is now done easily in 2¾ hours, due to the fact that we can use faster feed and heavier cuts. We now run all of our belts slack and get more work than before and would not be without 'Cling-Surface' for four times its cost."

The Under-Feed Stoker Co. of America, with general offices in the Marquette Building, Chicago, was recently awarded a contract to supply Jones under-feed mechanical stokers aggregating 15,600 h. p. to the Citizens' Electric Lighting & Power Co., of St. Louis. The merits of the Jones stokers were recognized and the award of the contract made against the strongest competition. Within the past 30 days Jones under-feed mechanical stokers have been installed as follows: In the Arcade, Permanent and New England Buildings, Cleveland, and by the Cleveland Crane & Car Co. and the Muncie, Hartford & Fort Wayne R. R.; the Ohio Farmers Fertilizer Co., of Columbus, and the Superior Steel Co., of Carnegie, Pa., have also installed Jones stokers. Second orders have also been supplied to the LaGrange (Ill.) Light & Water Works Co., the Montreal Mining Co. of Hurley, Wis., and the Niles & Scott Co., of LaPorte, Ind. In addition, sales aggregating 7,450 h. p. have been supplied to Canadian patrons through the Toronto office of the Under-Feed Stoker Co.

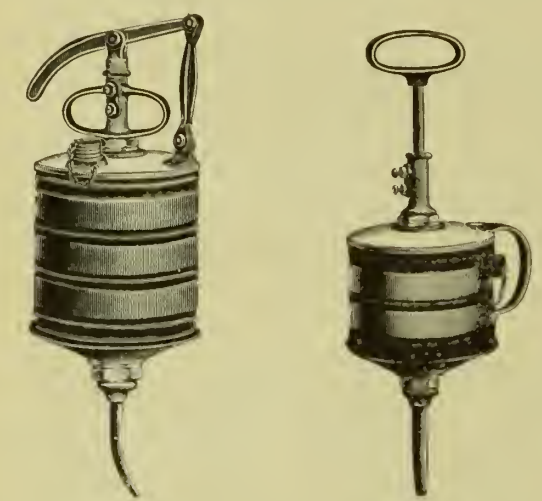
The Workingmen's College at Melbourne, Australia, has mailed to us its prospectus for 1902. The college is founded to improve the education of those who work and especially to facilitate the acquisition of a knowledge of handicrafts, arts, sciences and languages by the establishment of classes, workshops, libraries, reading rooms, laboratories, and museums. The admission price is moderate and the work which is being done is of the highest character. The teaching staff deals with all manner of subjects including engineering, metallurgical, chemical, mathematical, commercial, linguistical, and economic topics. The classes are held both during the day and evenings. Special railway fares are given the students of the college from all parts of the country and there is also obtained a reduction in car fares. The prospectus is handsomely illustrated showing all the different departments and an especially attractive illustration to us is that of the modelling class where pupils are given instructions in plastic treatment. The college provides the clay and easels while the students bring their modelling tools. A copy of "Brick" regularly appears in the library of the college and is much appreciated by the students.

The Frost Manufacturing Co., of Galesburg, Ill., is mailing a gorgeous catalog of crimson color bearing an embossed title—"Engines and Boilers", the principal products of this well-known company. The interior of the catalog is as attractive as the exterior. A fine view of the immense works is shown and there follows then, illustrated descriptions of the Frost automatic and throttling engines, which have attained a world-wide celebrity for reliability and high

grade manufacture. Fifty years of experience in building steam engines and in constant work of research, installment and development has resulted in the production of a class of steam engines which for excellence and reliability cannot be surpassed. All unnecessary finish in the Frost products has been done away with. The shafts, rods and pins are made of high grade steel, all parts are inspected and perfected and provided with ample means of lubrication, and the parts being made to templets, like parts of like engines are interchangeable. Some of the distinguishing features of the Frost products are the balance valve and relief plate, the main bearings, an ingenious crank pin oiler, and the "Standard" tubular boiler. The Frost dry pan is well known to clayworkers. All parts are accessible for oiling, are adjustable and can be easily and cheaply repaired. A special catalog for dry pans is issued to those interested. Any one well acquainted with good machiney will be well repaid by a perusal of this handsome catalog.

To Save Oil.

Engineers of power plants are quick to appreciate the waste of lubricating oils which follows the injudicious use of ordinary oil cans as well as some special forms of which the "squirt gun" type is a common one for a variety of applications, and they will be interested in the accompanying illustrations which show two forms of a device for economically applying oil to the working parts of



machinery, This is known as the Ironsides improved Tormay patent oiler, and was first designed for oiling of mine car wheels; when used for this purpose its advantages were so apparent that it was adopted in other operating departments, and the report is that a saving of 50 per cent in the oil used has resulted from the use of the device by some of the larger coal mining properties.

The oiler consists of a central working barrel containing a plunger and surrounded by an oil reservoir; openings in the working barrel, sealed or unsealed, according to the position of the plunger, communicate with the oil reservoir. The adjustability of the stroke of plunger governs the quantity of oil forced at each operation. When not in use the contents are not only preserved from leakage, but are also protected from dust and other impurities. The Ironsides Co., Columbus, O., is the maker of this oiler.

The Brookville Pressed Brick & Tile Manufacturing Co. has just finished the installation of its new machinery supplied by the American Clay Working Machinery Co., of Bucyrus, O. The plant has a capacity of 20,000 per day and the product is a very fine shale brick, the output of which commands a ready sale.

Receiver Appointed.

On April 5th, Mr. C. F. Davies was appointed receiver of the assets of the Simpson Manufacturing Co., located at Winthrop Harbor, Ill., and at once took possession of the property. At a creditors' meeting held on April 25th, the receiver reported informally, nominal assets amounting to about $9,000 and liabilities of about $21,000. The estimate was exclusive of the value of the plant which is covered by a real estate mortgage in the process of foreclosure. A committee consisting of three of the creditors was appointed at the meeting to make a more careful estimate of the value of the machinery, tools, etc., which came into the possession of the receiver, to report at an adjourned meeting.

Patent Notes.

We give below a list of the patents and trade marks relating to the brick, tile and allied clay industries granted since our last issue, prepared especially for "Brick" by William F. Hall, patent attorney, Equitable Building, Washington, D. C.:

695,590. Brick and Kiln Furnace. Mar. 18, 1902, Frank E. Swift, Washington, Ia.

695,483. Machine for Molding Artificial Stone. Mar. 18, 1902, Noyes F. Palmer, Brooklyn, N. Y.

695,621. Tile Floor. Mar. 18, 1902, Richard L. Moyle, New York City. Assigned to James Warner, same place.

695,647. Combination Tile. Mar. 18, 1902, Richard Moyle, New York City. One-third assigned to James Warner, same place.

696,026. Brick Drier. Mar. 25, 1902, Jonathan P. Fiske, Newton, Mass.

695,904. Brick Kiln. Mar. 25, 1902, Edward C. Brice, Colwyn, Pa.

697,914. Improvement in Bricks. Apr. 15, 1902, Percy Griffin, Orange, N. Y.

698,019. Die for Brick Machines. Apr. 22, 1902, Claude Holley, Albany, Ga., assignors to Chambers Brothers Co., Philadelphia.

698,031. Tile. Apr. 22, 1902, Benjamin P. Leslie, Brooklyn, N. Y., assignors to the Naething-Leslie Co., New York City.

The Texas Pressed Brick Co., of Wortham, Tex., has bought and taken charge of the C. J. Turner plant and commenced operations on April 3rd, after a thorough overhauling of every branch of the works. The machine used consists of a 4-mold dry press machine built by the American Clayworking Machinery Co., of Bucyrus, O., and the clay is a blue shale. New sheds and equipments are going up to meet the demands for brick in the vicinity and the company expects a most prosperous year.

BRICK

A Monthly Magazine, devoted to Brick, Tile, Terra Cotta and Allied Clay Industries.

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We want our readers to always feel that BRICK is their paper, and that what interests them interests its publishers and subscribers. We will therefore appreciate most highly any communications, questions, experiences or suggestions, or marked copies of local papers containing items of news pertaining to the interests of clayworking.

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A new brick works is being erected at Waynesville, N. C., at a cost of $50,000.

Shepfer & Moomaw, Sugar Creek, O., have built a new kiln with a capacity of 50,000 brick.

The Lehigh (Ia.) Clay Works will furnish 3,300,000 brick to be used in paving the streets of Fort Dodge.

The Trimble Brick Co., which was recently incorporated, has put its new plant at Hogansville, Ga., in operation.

The new buildings have been completed for the Peoria (Ill.) pottery, and the entire force is now working at full time.

Miller & Doyle, brickmakers, Renton, Wash., have doubled their force and now employ 80 men. The number will again be increased this season.

A. O. Fowler is operating his brickyard at Chelan, Wash., with a large number of contracts for brick on hand. One contract alone calls for 900,000 brick.

The Poston Brick Co., Crawfordsville, Ind., now operating 14 kilns, expects to build two new kilns at once to accommodate its rapidly increasing business.

Firebrick clay in large quantities has been discovered on the farm of T. H. Jones at Shelbyville, Tenn. Mr. Jones is considering the erection of a firebrick plant.

The Ogden (Utah) Sewerpipe & Clay Co. has ordered new and improved machinery which will increase its output to 5,000 ft. of 8, 10 and 12-in. sewer pipe per day, and is also building a number of new kilns. Although this is a comparatively young industry, it is rapidly becoming one of the most important in Utah. The product finds a steady market in Utah, Idaho and Wyoming.

Valuable deposits of potter's clay have been discovered on the farm of A. J. Stebbins, at Sparta, Mich., and local business men are organizing a company to erect a factory.

The Douglas-Whistler Firebrick Co. has broken ground for a new firebrick plant at Beaver Falls, Pa., which will comprise 15 kilns and have a capacity of 50,000 brick per day.

The brickyards at Wenatchee, Wash., are running at their full capacity to meet an exceptionally strong demand, and a larger part of the season's output is already contracted for.

The Shenango (Pa.) Pottery Co. has installed a complete system of fire-fighting apparatus at its works, and will train its employes to render efficient service in the event of a fire.

S. Hunsiker, of Guide Rock, Neb., has purchased a site for a brickyard at Belvidere and is erecting a large factory which will be equipped with every modern facility for brickmaking.

A brickyard has been opened in connection with the state penitentiary at Walla Wala, Wash., and 75 convicts are employed in making brick. The season's output is estimated at 2,000,000.

William B. Beckley, of New York City, representing eastern capitalists, has purchased a site for a sewerpipe manufactory at Kansas City, Mo. Options on clay lands have been secured, and it is planned to erect a plant at a cost of $50,000.

The Chicago Terra Cotta Works has ordered three carloads of clay from the mines of Dugdale & Klebenstein, Platteville, Wis., which has been pronounced of excellent quality for the purpose of terra cotta manufacture. If the experimental product prove satisfactory a new industry will be opened at Platteville.

A. R. Batley, of the American Clayworking Machinery Co., of Bucyrus, O., and B. P. Waggener will soon begin the erection of a plant for the manufacture of paving brick, pressed brick and sewer pipe at Atchison, Kan. The company has a capital stock of $75,000, and work on the proposed plant will be begun early in June.

J. W. Wells & Bros., brick manufacturers, Chattanooga, Tenn., report business exceptionally good, with the most favorable prospects for the remainder of the season's run. Beside a large number of contracts for brick for the erection of residences, the company will supply brick for a new medical college at Chattanooga and a university at Athens.

Messrs. Warner & Boland, who recently purchased the old Martin pressed brick plant at Crawfordsville, Ind., expect to remodel the building and install new machinery at a cost of $19,000. The shipping facilities from this plant are exceptionally good, and it is expected to have the product on the market early in July.

The North Canal Brick Co. is remodeling its plant at Oskar, Mich., and installing new machinery preparatory to increasing its output to 40,000 brick per day. The prospects of the company are most favorable in view of the present building activity in the copper country. Charles Heusa is president, and C. J. Wickstrom, secretary, both of Calumet.

Interesting Tests of Pavements in Baltimore.

In the annual report of B. F. Fendall, city engineer of Baltimore, Md., for the year 1901, the following statement is made concerning an interesting test now in progress on Holliday St. in that city. A block was laid with different pavements with two objects in view: First, to test the relative merits of the various materials used, and second, to test the value of old cobble stone relaid as a sub-base.

Mr. Fendall says: "Sufficient time has not yet elapsed to venture an opinion on the first question. As to the second, the conclusion has been reached that cobble relaid is not as good as concrete for a sub-base, and the slight difference in cost in favor of the cobblestone will not justify its use in the future. If it is practicable to put improved pavement on top of the cobble without relaying or with cement mortar, and the asphalt blocks, which are 4x4x12 in., were laid in this mortar before it had begun to set, and the joints were grouted with silica cement and sand. The brick and wooden blocks were laid on a cushion of sand about 1½ in. thick. The joints of the wooden blocks were poured with hot coal-tar. The joints of the vitrified brick or blocks were filled with fine stone dust well swept in.

Samples of the different makes of brick were sent to A. N. Johnson, Engineer of the Highway Division of the Maryland Geological Survey, and tested in the standard rattler, with the results as shown on the plat. A description of the rattler used and the method of making the tests was given on pages 93 and 94 of my report for 1900. The brick were taken from the rattler at the end of 300, 900 and 1,800 revolutions and weighed. This was done to determine what

TESTS OF PAVING BRICK MADE IN THE LABORATORY OF HIGHWAY DIVISION OF MARYLAND GEOLOGICAL SURVEY FOR CITY ENGINEER, 1901.

No.	Name of Brick.	Color.	Size Inches.	Weight Cu. In. Lbs.	Volume Cu. Inches.	Weight Lbs.	Rattler Test, % Lost.	Cross Breaking, Strength Pounds.	Mod. Rupture, Lbs. Per Sq. In.	Absorption Per Cent.	Sample by and Remarks.
49	Johnsonburg Brick Co.....	Red	8.6 x 2.3 x 4 1	.086	81.1	7.	21.2	13,398	3,158		Manufacturer.
50	" " "	Buff	8.6 x 2.4 x 4¼	.083	87.7	7.3	21.1	12,593	2,626		Manufacturer.
52	McMahon, Porter & Co.....	"	9¼ x 3¼ x 4	.074	119.8	8.9	22.5	.....	.....		Manufacturer.
53	" " "	"	8.5 x 2.23 x 4	.085	75.8	6.46	50.	.....	.....		Manufacturer.
54	Montello Brick Co.....	Red	8.63 x 3.97 x 3.06	.082	104.8	8.69	18.4	15 787	2,946	2.1	Manufacturer.
55	Welsh, Cloninger & Maxwell...	Buff	8.2 x 2.35 x 3.9	.080	75.2	6.08	29.9	10,142	2,572	1.1	Manufacturer.
56	Queen City Brick & Tile Co.....	Red	8.8 x 3 3 x 4.2	.081	121.9	9.93	34.0	14,709	2,324	2.5	Manufacturer.
60	McAvoy & Co.....	"	8.84 x 301. x 3.83	.095	101.9	9.7	24 2	12,703	2,596	1.4	Filbert P. & C. Co.
61	" "	"	8.26 x 2.64 x 3.85	.084	83 9	7.1	29.8	13,028	3,000	1.2	Filbert P. & C. Co.
67	D. P. Guise	"	9.11 x 3.23 x 4.05	.081	119.3	9.66	30.9	13,710	2,337		
94	Welsh, Cloninger & Maxwell...	"	....	.....	.....	10.5	19.9	.....	.....		City Engineer.
96	" " " " ...	"	½ block.	.....	.....	.....	23.	.....	.....		City Engineer.
97	Canton Iron Rock Block.....	"	8.5 x 3.4 x 4	.086	115.6	10.	15.2	.....	.....		
98	" " " "	"	8.5 x 3.4 x 4	.086	115.6	10.	20.1	.....	.....		
	" " " "	"	8.5 x 3.4 x 4	.086	115.6	10.	17.1	17,000	2,849		Average of 18 tests.
74	Mack M'f'g. Co.....	Buff	9 x 3 x 4	.083	108.	9.01	19.4	.....	1,970		
81	" " "	"	9 x 3 x 4	.083	108.	9.01	26.1	.....	.....		
	" " "	"	9 x 3 x 4	.083	108.	9.01	22.0	11,948	2,093		Average of 17 tests.
	Montello Brick Co.....	Red	8.5 x 3 x 4	.097	90.	8.8	18.7	.....	.....		Holliday street.
	T. B. Townsend.....	"	9 x 3 x 4	.081	108.	8.8	23.7	.....	.....		Holliday street.
	Porter.....	Buff	9 x 3 x 4	.084	108.	9.1	24.5	.....	.....		Holliday street.
	D. P. Guise.....	Red	9 x 3 x 4	.088	108.	9.5	23.5	.....	.....		Holliday street.
	Welsh, Cloninger & Maxwell....	"	9 x 3 x 4	.085	108.	9.2	21.9	.....	.....		Holliday street.

otherwise disturbing the original construction, such a system has merit, will save money, and is desirable."

The following detailed description of the sample pavement is from the report of O. W. Connet, assistant city engineer, to his chief:

A sample pavement of eleven different kinds of paving material was laid on Holliday St., from Baltimore St. to Fayette St., as shown on the accompanying plat. The street was selected because of the large amount of travel, the street railway tracks and cross-overs, and because of the clear space 18 ft. wide between the west rail and the west curb, thus giving the worst and the best conditions on the same street.

The foundation was made by taking up the old cobblestone pavement, resurfacing the tracks and repaving the cobblestone so that the upper surface when rammed is about five inches below the finished surface of the different pavements. The surface of the cobblestone under the sheet asphalt was covered with concrete so as to bring the surface up to within 3½ in. of the finished pavement, and on this was laid 1½ in. of binder and 2 in. of wearing surface. The surface of the cobblestone under the asphalt blocks was covered the relation between first loss and final loss as shown by the rattler is, and to observe whether the brick follow the same law in the street under actual conditions of travel. It will be noted that the brick which has the lowest per cent of loss after 300 revolutions or whether they follow the same law as shown by the rattler test, does not have the lowest per cent after 1,800 revolutions, and the question to be determined is whether under actual conditions in the street the brick which clips off worst at first indicates poor brick and that the test after 1,800 revolutions should be taken regardless of the first loss. This can only be told by observing the brick in the street.

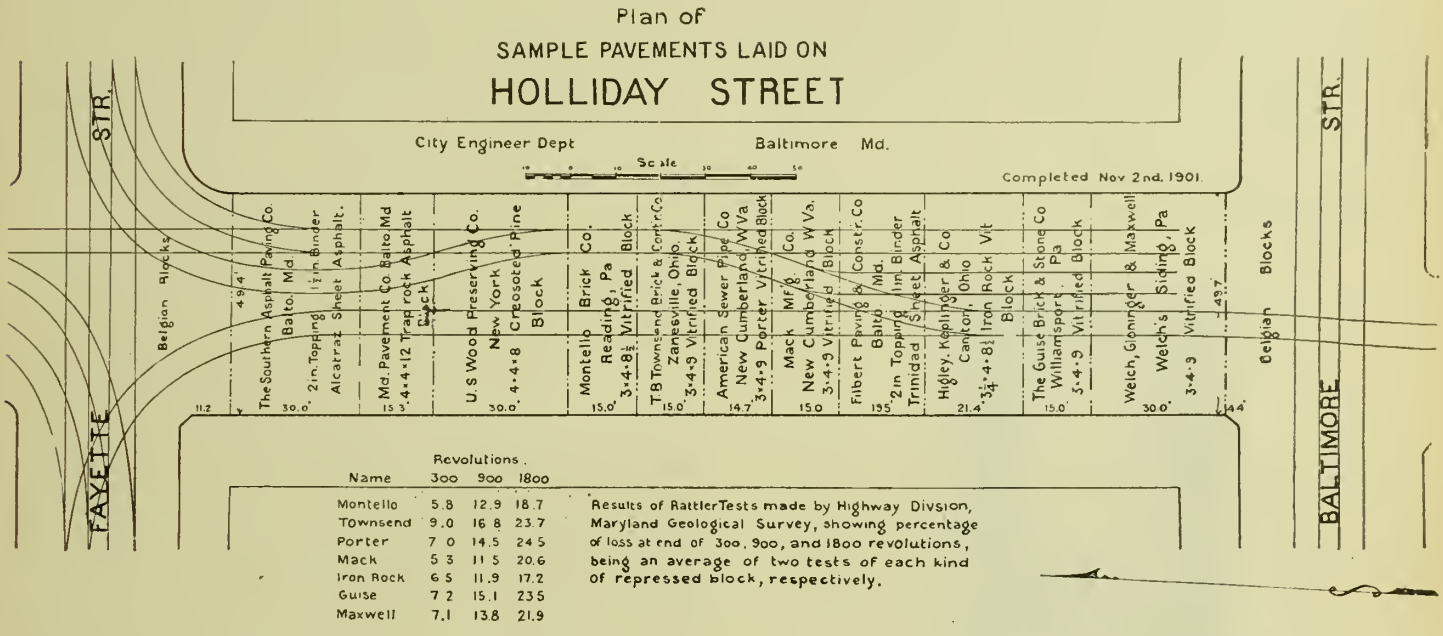
The city furnished the foundation and did all the work of laying except the asphalt pavements, which were laid by the companies furnishing them. The city paid for the labor. The Mack, the Maxwell and a part of the Canton brick were purchased by the city. All the rest of the paving material was furnished free of cost to the city by the different companies.

The cobblestone foundation and Belgian block repaving at the ends of the block was relaid under the direction of Mr. John S.

Patterson, at a total cost of $743.99 for labor and material. The cost to the city of the paving materials and laying the same is as follows:

Labor laying all the pavements	$596 99
Brick purchased to complete pavement	267 10
Sand hauling and sundries	213 09
	$1,077 18

The total area exclusive of the rails is 1,155 sq. yd., so that the foundation, including repaving of Belgian blocks, is 64 cents per sq. yd., and the cost to the city for the wearing surface and laying is 93 cents per sq. yd., or a total of $1.57 per sq. yd. The various pavements were laid on the cobblestone foundation immediately after it was laid. It was observed that the sand settled between the stones unequally and showed worst next the rail. It would be better where this foundation is used, to allow the travel to pass over it for a week or two before laying the wearing surface, in order to allow the sand and stone to settle thoroughly together.



Vitrified Brick Tests.

The testing of brick for the department was made by the Highways Division of the Maryland Geological Survey, as was done last year. For description of rattler and method of making test, see page No. 93 of my report for last year. There were 52 rattler tests made in all. The accompanying table gives the individual results of 19 tests, and the average of 18 tests made of the Canton blocks and of 17 Mack blocks. The tests are taken from 285,000 vitrified blocks used on St. Paul St. and 325,700 used by the city.

New Incorporations in Ohio.

The Enameling Brick Co. and the B. & K. Co. referred to under the new incorporations in the May issue of "Brick" are really the same corporation. The company was chartered under the laws of Delaware with a capital of $60,000. A large plant will be erected at Leavittsburg, O., and brick will be enameled in various colors.

The officers of the company are as follows: J. A. Blackburn, Leavittsburg, president; F. W. Aldrich, Warren, vice-president; E. C. Kelly, Cleveland, secretary and treasurer. The principal offices will be at 509 Chamber of Commerce bldg., Cleveland. Deforest E. Brooks, a prominent member of the brick world of Kansas City up to the present time, will take charge of the plant.

F. W. Aldrich, the superintendent of the Blackburn Face Brick & Tile Co., has been actively engaged in superintending the erection of the buildings and the installation of the machinery and the plant is almost ready for business. Practically the same persons own both plants, the only reason for separate incorporation being the difference in the product. The two companies own 60 acres of the very best clay land and within two months both will be prepared to cope effectively with the large number of orders already placed for their respective products.

The Dickey Clay Manufacturing Co.

The Dickey Clay Manufacturing Co. seems to have no limit of expansion. It is one of the most enterprising concerns in this country and has recently closed a contract for a new plant at Chanute, Kan. One hundred and forty-eight acres of clay lands have been purchased and the construction of what will be the Walter S. Dickey Clay Manufacturing Co.'s largest plant is being actively carried on. Spur tracks from the Atchison, Topeka & Santa Fe and Missouri, Kansas & Texas railways will run through the plant. It is a fine location just south of Chanute. Two gas wells will supply the fuel and the city of Chanute has given the company a liberal contract for water from the city water works plant. The clay is of the finest kind and extends downward in inexhaustible quantities. Borings of 60 ft. depth have not reached bottom of the clay bed. The Dickey mills are capable of grinding from 300 to 500 tons of shale daily, and probably from 150 to 200 men will be employed. Building brick, vitrified paving brick, fire proofing, hollow brick and farmers' tiles will be the chief products, while two new lines will be manufactured in the shape of tile fence posts and cattle guards. The upper parts of the fence posts will be of iron pipe and the part that goes into the ground will be of burnt tile.

The new brick plant of Augustus Honeck of Bloomville, O., is being equipped with a full outfit of Martin machinery, including one of the old reliable machines with pug mill, elevator, disintegrator, sander, &c. Mr. Honeck expects a very busy season and is getting his yard in shape as rapidly as possible.

Experimental Work in Brickmaking.*

BY EBEN RODGERS, ALTON, ILL.

Dr. Franklin said in a letter to a friend in England, written about 1770, "You seem desirous of knowing what progress we make here in improving our governments. We are, I think, in the right road of improvement, for we are making experiments." As the result of this experimental work, started under the most trying circumstances, and continued more or less up to the present time, we are today living under the most successful form of government in the world. With this great example of continuous progress by continuous experimenting, ever before us, should we all not be tempted to use this means to promote our individual success?

No industry can attain any great degree of success, by treading continually in the old beaten paths, for success is only attained by progress. Progress means the developing of new and correct ideas, and new and correct ideas can only be substantiated by experiments.

Who has a broader field in which to experiment than the brick maker? With material underlying nearly the whole earth's surface, that is capable of being made into some sort of clay product, why

EBEN RODGERS.

should not experimental work be a very important branch of our business? While it is true that a number of our manufacturers have entered this field with considerable success, are we in general as far advanced in our business as many other industries with which we should, at least, be on a par? I think not. One reason for this is that we have not spent our proportion of energy and capital in perfecting new and better methods. Another reason is, that we, as managers, have neglected to supply ourselves with a technical knowledge of our business, and we, as employers, have failed to employ this knowledge. I think it is safe to say that our raw material varies more than that used in any other industry, and it is also safe to say that we use less effort than any other industry to discover in advance the effect of these variations on our product.

How many superintendents know how to make a chemical analysis of the clays they are working? How many know when they are making a possible or an impossible mixture, why they make the mixture, and what the result will be? How many burners know why they produce burned brick by setting green brick in a kiln, closing it up, drying it off, burning a number of days and obtaining a certain settle? Would not a technical knowledge of the business, or the presence of some one having that knowledge, be of great assistance to these men and enable them to handle their work with more intelligence? If the enormous amount of capital invested in chemical and testing laboratories, in other industries, has proved a paying experiment, why would not a small investment along this line pay in our business? In following the construction of a large steel plant, for which we were furnishing the material, I was very much taken with the fact that one of the first and most complete buildings erected on the ground was the chemical laboratory. This laboratory, when completed, contained every conceivable appliance for testing the chemical and physical properties of steel castings. A number of chemists were employed to make analyses of the raw material, of the fuel used and of the gases produced by the fuel, and to test the physical qualities of the steel castings produced. With all this technical information at hand, I note that they sometimes make faulty castings. Is it surprising, then, that we, with little knowledge of the composition of our raw material, knowing little about the causes that produce the effects, should occasionally produce ware that is uneven in color, quality and hardness. Some attribute these irregularities to bad luck, but I think it would be nearer the truth to attribute them to what Sam Jones calls "Ignorance." It seems to me that it would be a paying experiment for every manufacturer of clay products, to have a laboratory, in proportion to his capacity, and employ the knowledge of a chemist to experiment with the clays and instruct the superintendent as to the proper mixing and handling of his material, and to instruct the burner as to what effect fuel gases, drafts and different degrees of heat will have on these mixtures.

This would prevent us from spending a great deal of capital and energy in attempting to make combinations and produce results entirely at variance with the laws of nature.

I think it would also be a profitable experiment to have complete appliances for testing the physical properties of our finished product. It would be much cheaper and more satisfactory to find out the physical imperfections of our product, and remedy them before placing it on the market, than it is to send it out not knowing what satisfaction it will give, and run the risk of having to replace it, or have your reputation damaged as a manufacturer of first class material.

The complete knowledge of the business that this system would give would be of great assistance in all departments and would enable the working out of experiments along different lines with more intelligence. All experiments should be performed, as far as possible, independently of the regular work. By developing the new ideas and methods in this manner, if they are successful, they can be readily applied in the daily practice. If they are not correct, you have been to a small outlay compared to that of involving your whole plant in the experiment. I have in mind a plant, well built, having good material and turning out good brick by ordinary methods. This plant was closed out at an entire loss to the original owners, on account of using their entire plant trying to develop a new idea, instead of having a separate department for this work. Had they been satisfied to go on making good brick at a reasonable cost, while they were experimenting in another department, on how to make better brick at a less cost, they would no doubt have a good paying investment today.

Very few new ideas ever work successfully in practice without first going through the experimental stage, and it is very important that we do not disturb our regular run of work by continually introducing into it methods that have not been tested for practicability. The working out of experiments adds a spice to the general business. There is an uncertainty about the success or failure of the experiment that creates an interest, that varies the monotony of the daily grind of routine work. There is room in most every department for the application of some new idea or method, the practical part of which has been tested before being applied.

We should ever be on the watch for new ideas that will help us

*Read before the 16th Annual Convention of the N. B. M. A.

to operate our plants with more system and economy. Beginning at the clay bank, experiment has shown that a steam shovel is the most economical means of excavating where the material is obtained from a face. Steam shovels are now being made in sizes to suit the smallest as well as the largest capacity. They are much more reliable than men, as they never strike, are always ready to work in all kinds of weather, and can do a better job of mixing the different strata of clay than it is possible to do by hand. I think a steam shovel of proper capacity would be a paying experiment on any yard working a bank with a face. We expect soon to experiment with a steam shovel for digging surface clay for our dry press department. We are of the opinion that by digging the clay with a steam shovel and drying it in an artificial drier, we will have a more satisfactory system than that of having acres of sheds and depending on the weather during the summer months to get them full. The ability to get your full supply of clay daily regardless of ordinary bad weather, will add more materially to the profit and loss account at the end of the year than one would think without going into details. Another advantage gained in the digging of surface clay with a steam shovel, over the old way of plowing up and bringing in each stratum separately, will be the thorough mixing of all of the different strata into a uniform mixture, thus insuring a uniform brick and preventing the continuous changes that are bound to take place in working each strata separately.

In the machinery department experiments having in view arrangement for handling material automatically, can almost always be worked out to advantage. The necessary handling of material should be carefully guarded against, as each handling requires either power or labor, and they will both add materially to the expense account at the end of the year, be they ever so small each day.

In the drying it is necessary to find out by experiment just what treatment your clay will stand, and see to it that it gets this treatment at all times. To experiment on this point it is not necessary to build two or three different kinds of $10,000 driers.

This brings us to the burning. In this department there has probably been more experimenting done than in any other, and judging from some of the methods used, through ignorance of the nature of the material and lack of knowledge regarding drafts and temperatures, it would be hard to decide whether the object in view was to burn brick or money. Some of us have been very successful in accomplishing the latter result. In this department our technical knowledge would be most valuable. This is the most expensive department to operate and maintain, and in this department occur also most of our wastes.

Here I would say again, keep your experiments clear of your main work. The loss of one kiln of brick through experimenting would more than pay for the erection of an experimental kiln where you could fail to your heart's content without materially injuring your regular output, and if you are successful, your idea can be applied more intelligently and with an assurance that your product will not be damaged for marketing. There is so much room for attaining better results at less cost, in this department, that it is not surprising that we are willing to take such leaps into darkness, trusting to luck that we will land on something better. It is to be hoped that through diligent and scientific experimental work someone will soon produce a kiln in which we can burn all perfect No. 1 brick and utilize all of the heat produced by our fuel.

There is also an unlimited field for experimental work in adapting clay products to new uses, and the more familiar we become with the technical side of our business, the more readily we discover these uses. We must not only satisfy ourselves as to the adaptability of clay products to these uses, but we must demonstrate to the public, to their satisfaction, that they are so adapted, before we can expect them to be used. Clay workers in general are slow to take up the work of demonstrating. Many industries spend fortunes each year in demonstrating to the public that their product is just what they claim for it, with the result that their sales are sufficiently increased to justify the extreme expense.

Thus it runs from the clay bank to the market, a vast field in which to work out experiments for our own betterment and profit. Eminent success is in store for the energetic, pushing young men of today who will provide themselves with a technical education and couple it with practical experience in clay working.

Peat in the United States.

The occurrence and uses of peat are described by Mr. Heinrich Ries in "Mineral Resources of the United States," 1901, now in press, United States Geological Survey, David T. Day, Chief of Division. Peat is most commonly formed from a moss, which thrives in moist, north temperate climates. There are probably, says Mr. Ries, no large areas in Ireland and northern Germany, but many small deposits exist, some of which may cover several hundred acres. Except in the case of those close to the Canadian border, most of these peat deposits are probably rather high in ash or mineral matter. These impure peats or muck make a very rich soil. The peat is at times underlain by marl, or in rarer instances by bog iron ore.

The best known use of pure, or nearly pure, peat is as a fuel, but with wood and coal so cheap no successful attempts have been made in the United States to utilize it for this purpose. Peat can also be used in the manufacture of gas, alcohol, and charcoal. On account of its fibrous character it can even be successfully worked up into paper, cloth or rope.

The partly decomposed moss has valuable antiseptic properties, and under the name of "moss-litter" is sold for bedding in stables. The growing moss is also used as packing material. It is in the three last mentioned applications that the successful use of American peat is probably to be looked for. Curiously enough, peat for packing purposes is sent from Holland to the United States, where it is used for packing American wines, which are then exported to Europe. The peat industry of the United States seems as yet not to have gotten beyond the experimental stage.

Many scattered deposits of peat are found in New England, and peat, more or less impure, is found in New York and New Jersey, and also in the Dismal Swamp of Virginia and North Carolina. In Ohio there is little true peat, but there are many large beds and muck bogs, valuable agriculturally, along the northern border of the state, from Ashtabula, to Hancock counties. In northern Indiana, in like manner, there are the peat deposits from Noble across to Lake counties; and in the northern, northeastern, and central portions of Illinois peat is said to be fairly abundant, large deposits occurring also in the Green River Valley on the west, and in Union, Alexander, Jackson and other southern counties. Michigan has many beds of peat, as might be expected in a region where glacier lakes are so abundant. Experiments are being made at Fenton, Genesee County, to test the possible value of this material for cement burning. There is an abundance of peat also in Wisconsin, large areas being known in Wood, Portage, Jackson and Juneau counties. There is an abundance of peat in Minnesota, but little is known concerning it. Much peat is found also in southern Iowa, but is not used for fuel and very little thought of it for fertilizing purposes. Mr. Ries closes his report with a list of general works and special papers dealing with peat.

The Herman Brick Co., which was recently organized with a capital stock of $25,000, has put in operation its new plant at Whittmet Station, employing 35 men. A complete equipment of modern machinery has been installed and the present output of the plant is 45,000 brick per day.

The Strength of Sewer Pipe.

One of our correspondents has written inquiring as to the strength of sewer pipe and the proper methods of testing the same. We have referred this letter to Prof. W. K. Hatt of Purdue University, who writes as follows:

A glazed sewer pipe with vitrified clay has three qualities which are of advantage: Strength to resist the pressure of the earth filling in deep trenches or the pressure due to steam rollers; smooth-

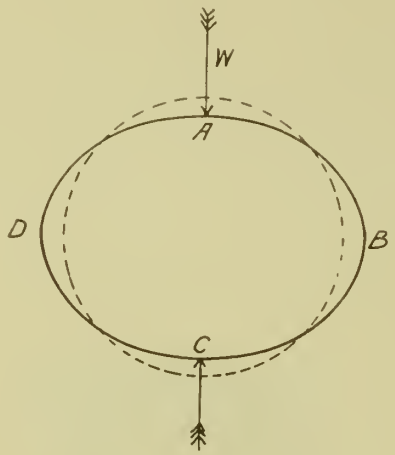


FIG. 1.

ness to allow the passage of water, sewage, etc., at proper velocities on very light grades; imperviousness to prevent leakage or absorption of the liquid that the pipe is designed to carry.

The strength of the material of the pipe might be tested in the same way as we test a paving brick in the cross-breaking test. That is, a piece of the pipe might be taken of a length about 10 times its thickness and loaded in the center while supported at both ends. What is called the modulus of rupture might thus be obtained; this value being for good pipe from 1,600 to 1,800 lbs. per square inch.

But is is more convenient to test the sewer pipes themselves. A pipe is laid on two end supports and loaded at the center. The breaking load is measured. This is a convenient test and will give information concerning the quality of material in the pipe, and in some degree its ability to resist vertical pressure from the earth filling when rested on an uneven bed in the trench.

As ordinarily tested, however, in this manner, the length of span is not sufficient to allow the pipe to break as a beam; that is, it does not break in two parts at the center of the span. On the contrary the pipe ordinarily breaks in four pieces. The action may be compared with the action of a load placed on the top of a thin flexible hoop as shown in Fig. 1. The hoop is strained to the greatest degree at the points A, B, C and D. In case of the pipe, fractures occur, as shown in Fig. 2, at the top and bottom AA′ and the side lines BB′.

Professor Greene in his recent work on Structural Mechanics has shown that a load, W, placed on the top of the pipe supported along its bottom edge produces a bending action along the top edge of the same amount as will be produced by the same load W, resting on a beam (Fig. 3 b) of a span of about once and one-quarter times the radius, the width of the beam being the length of the pipe and thickness of the beam being the thickness of the pipe as shown in Fig. 3 a. Thus, if an 18-in. pipe 1 5-16 in. thick rested on supports 24 in. apart and broke under a center load of 4,000 lbs., the bending moment in the material at the top of the pipe would be equivalent to that produced by a load of 4,000 lbs. acting as the center of a beam 22½ in. in a span 24 in. wide and 1 5-16 in. thick. The modulus of rupture may be figured as follows:

$$f = \text{modulus of rupture} = 15Wr \div 8lt^2.$$

Using this beam as a basis of calculation we may obtain the modulus of rupture of the material in the pipe, as shown in formula; this is a measure of the quality of the material. From a series of tests, Professor Greene figures the value of modulus of rupture of the pipe material as shown by tests on the full-sized pipe to run from 1,200 to 2,000 lbs. per sq. inch.

Evidently as a pipe becomes larger in diameter the leverage of the load increases and consequently the thickness of the pipe must be greater for the larger sizes of pipe to withstand this greater leverage. Since the strength of a beam increases as the square of its thickness and the leverage of W increases as the diameter of the pipe, we must reason that the thickness of a pipe must increase as the square root of its diameter, provided the material is of as good quality in the larger sizes as in the smaller sizes. Thus, if a 6 in. pipe is 1 in. thick, a 24 in. pipe must be 2 in. thick in order to hold the load with safety.

This method of supporting a full pipe at the ends and loading it in the center is perhaps the best method of testing a pipe. It is better than the method which supports the pipe on blocks of wood hollowed out to fit the pipe. This latter method will give higher results, but the conditions of test cannot be as definitely fixed.

It must not be thought that the load W, as found above represents the weight of earth that the pipe will hold when laid in a trench. There are two reasons why this should not be so. In the first place, the pipe is supported, and therefore strengthened, by a well-tamped back filling. It is as if the hoop in Fig. 1 were supported by two sides supports at B and D. In the second place only a part of the earth filling transmits its weight to the pipe below, the remainder being held by the arching action of the filling against the side of the trench. This arching action depends on the friction and cohesion of the material which would be greater, for instance, in case of gravel than in case of wet clay.

This brings up the question of the safety of sewer pipes of various sizes when laid in trenches of different depths. Experience shows that the thicknesses used in our practice are adequate to withstand the ordinary conditions and service. This is proved by

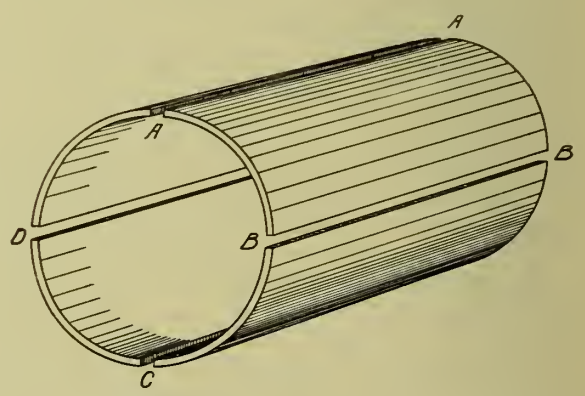


FIG. 2.

the absence of breakages in case of a good quality of pipe carefully laid.

Experiments, however, have been made to determine the actual factor of safety enjoyed by sewer pipe while resting in trenches at different depths, and to ascertain under what conditions it is necessary to use pipe of double strength. A description of these experiments will be found in the Journal of the Association of Engineering Societies, December, 1897, in a paper by Mr. F. A. Barbour. He obtained a number of sewer pipes 6 in. to 24 in. in

diameter of ordinary and double strength, and tested their strength, as follows: He surrounded them with earth, tamped as in ordinary construction, to a depth of from 6 in. to 18 in. To this earth filling he applied pressure by a hydraulic plunger until the pipes broke, measuring the load at the time of breaking.

The pipes broke in four pieces as shown in Fig. 2. His experiments showed that a load of lineal foot length of 2800 lb., in case of standard pipe, and of 4200 lb. in case of pipes of double strength, would crack these pipes under the conditions described. (A load of 2800 lb. per lineal foot in case of a 6-in. pipe means a load per square foot of 5600 lb.)

Having found what any given pipe would stand, Mr. Barbour next determined what pressures might be expected on a pipe when laid in the bottom of a trench. To accomplish this, he laid a hydraulic press apparatus, in place of the pipe, at the bottom of the trench and covered it with a platform. The dirt filling was thrown in on this platform, and part of the weight of the filling was transmitted to the platform. The weight indicated on the hydraulic apparatus was taken to be the pressure carried by the pipe.

Of course, the platform cleared the sides of the trench. This trench was about 5 ft. long and the depth of the dirt filling ranged from 6 in. to 9 ft. The slope and width of the trench varied in different experiments. The sides of the trench were sheeted in some experiments; and in others they were in their natural state. The ends of the trench were always sheeted. Damp loam was used in one experiment and a mixture of sand and gravel in the others.

The test showed that only a part of the weight of the earth filling reached the pipe. Up to 5 ft. deep, the pressure decreased very rapidly, above that it decreased more slowly. Thus with 3 ft. of gravel filling in a trench with straight sides, the pressure transmitted was only 50 per cent of the weight of the earth in the trench; at 4 feet, 45 per cent.; at 5 feet, 42 per cent.; at 6 feet, 41 per cent.; at 9 feet, 38 per cent.

Thus an 18-in. pipe in a 9-ft. gravel trench would carry a weight of 100x9x0.38=352 lb. per square ft. (earth at 100 lb. per cu. ft.).

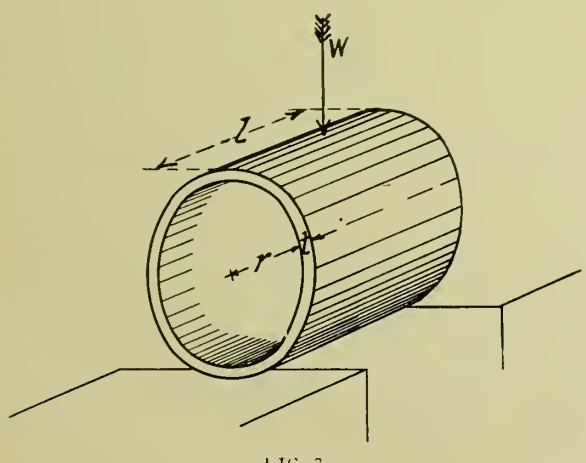


FIG. 3.

Since this 18-in. standard pipe has a strength of 2800 lb. per running foot or 1860 lb. per sq. ft., the factor of safety is about 5.

In a wet clay trench the factor of safety would be less. Mr. Barbour did not experiment with this material; he urges, however, that at depths above 10 ft. the fraction of the weight transmitted will be the difference between the coefficient of friction of the material and unity. Thus wet clay with a coefficient of friction of 0.35 will transmit 0.65 of its weight to the pipe underneath. Whereas, the sand and gravel with a coefficient of friction of 0.69 will transmit but 0.31 of its weight (as shown in the latter case by his test). Using this same example of an 18-in. pipe in a 9-ft. trench of wet clay, the factor of safety is about 3.3.

The effect of live loads such as steam rollers in loading a pipe for underground is uncertain. Mr. Barbour's experiments seem to show that about the same per cent of live loads is transmitted as weight of earth filling. If a road roller is taken, which will give a pressure of 2500 lb. per sq. ft. of surface on a clay trench,

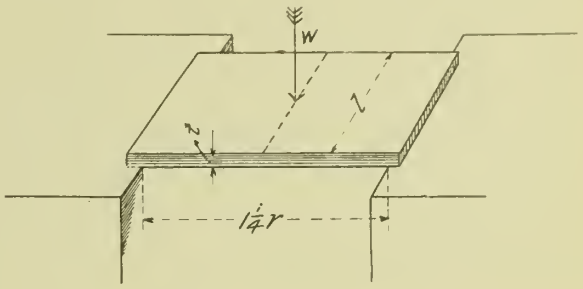


FIG. 4.

this will add to the 18-in. pipe of above example 1625 lb. per sq. ft., making a total of 2200 lb. per sq. ft.

Since the 18-in. standard pipe will stand only 1860 pounds per sq. ft. this wet clay trench would demand a pipe of double strength, which experiment shows a capacity of 2800 lb. per sq. ft. The amount of weight of a road roller transmitted is, however, involved in some uncertainty.

The Northwestern Terra Cotta Co., of Chicago, has purchased a site for a new factory in the vicinity of Diversey St. and Hermitage Ave.

A. Thalmeimer has discovered a rich deposit of white clay on his property at Mt. Penn, Pa., and is making preparations for its development.

The Capital City Brick & Pipe Co., of Des Moines, Ia., will furnish the brick to be used in the erection of a large medical institute at Des Moines.

B. F. Earl, of Niles, Mich., is promoting a company to build and operate a large brick plant at Niles. A 40-acre tract of superior clay lands has been secured.

The Denton (Tex.) Pressed Brick Co. has begun the erection of its new plant which will have a daily capacity of 50,000 brick. W. C. Weeks, secretary and treasurer of the company, will supervise the operation of the plant.

The Ohio Brick Co. has broken ground for its extensive new plant at Toledo. The company has elected the following officers: A. R. Kuhlman, president and manager; George G. Metzgar, vice-president, and Richard Kind, secretary-treasurer.

Land Drainage Profit. The editor of the Drainage Journal, C. G. Elliott, has just issued an attractive pamphlet entitled "Land Drainage Profit" setting forth the value and profit of underdraining land. Many instances are quoted giving figures and facts of underdrainage, and other features of drainage are dealt with in succession such as co-operative drainage, the relation of drainage to irrigation, under drainage for fruit culture, drainage for the garden, and concludes with a story on the Buckeye Traction Ditcher as told by its manufacturers. The matter contained in this pamphlet is calculated to interest the reader and to be of material benefit to those who have not as yet, given the subject any attention.

S. J. Plant, Brick Manufacturers' Engineer.

There is nothing more interesting to the clayworker than to sit around in a hotel lobby or alongside of a kiln listening to the life experience of some one whose position in the brick manufacturing world entitles him to respect and attention. Every convention, whether state or national, has offered such opportunities for this experience-telling and it is our pleasure here to present a literary lobby-talk on the up-hill experiences of the subject of this short sketch.

Mr. S. J. Plant saw the dawn on a brickmaking horizon for the first time on the first day of March, 1849, in the old-fashioned town of Oldbury, near Birmingham, England. Here he received a common school education and during the school vacations he spent the majority of his time at his grand-father's brick works, where his father held a prominent position. It was natural that the young Plant should grow up in the paths of his clayworking predecessors. Before he was ten years old he was made happy during his vacation by his first brickmaking job. This consisted of taking a seat near the door of a starting kiln as a listener for "pops" and at the first pop he had immediately to give the alarm to the burner who would partly cover the fires to lessen the heat. Mr. Plant's grandfather, Stephen Whitehouse, was in his day one of the best-known blue brick manufacturers in England. He also manufactured red stock brick, house floor quarries, roof-other lines, all these being classified under the heading of odd stuff. Most of these ing tile, sewer pipe and products were burnt in down-draft kilns and Mr. Plant says that it would be a surprise to some people today if he could explain the construction of these kilns, for it would abundantly prove, that, after all we are a generation of mimics and there is scarcely anything new under the sun. The whole of the Whitehouse family were engaged in the brick business and it was often said of them that they could place the fire in any part of the kiln by a mere twist of the shovel.

S. J. PLANT.

In the fall of 1863 Mr. Plant's parents started to move to Canada and the whole family left from Glasgow in the good ship St. Andrew and gave up brickmaking and tributes to Neptune for nineteen days. It was with considerable joy that the boy Plant set foot on Canadian terra firma. His father commenced the manufacture of brick and sewer pipe at Toronto and S. J. Plant worked with him until the fall of 1867, when he packed his grip and traveled to New York to try his luck in the United States. He soon obtained a position as sewer pipe maker with the Old Salamander Fire Brick & Sewer Pipe Works at Woodbridge, N. J.

The following spring he was called home by his father to take the superintendency of his works, remaining in that position until 1872, when he again left Toronto, this time for San Francisco, Cal., to take charge of a common brick yard with a capacity of 64,000 per day. The bricks were hand-molded by Chinamen, dried in the sun, set in large clamp kilns and burned with wood in the usual manner. Here he remained until he tired of Chinamen and the crude methods of making brick, when he returned East to devise a machine and a kiln that would make and burn good brick. For the next ten years he occupied himself with the hardest kind of work, for he would labor hard all day in the brick factory and at night work at home on his models of kilns and brick machines. May 9, 1882, he secured United States and Canadian patents on a horizontal stock brickmaking machine believed to have been the first of its kind; several similar machines are now on the market. Aug. 15, 1882, he was granted United States and Canadian patents on a continuous down-draft kiln. The work of developing these patents supplied him with invaluable experience, but it was a most expensive time, and having spent the most of his money in the furtherance of his ideals, he decided to let matters rest a while, intending to recuperate, and afterwards show the clayworking fraternity what great things he had in store for it. It has been said by a well-known poet that "The best-laid schemes o' mice an' men, gang aft agley," and the schemes of Mr. Plant were no exception to this truism.

During Mr. Plant's absence his wife had used all his patterns and models for kindling wood and declared that he had to quit the business of inventing, for he had spent several thousand dollars on the patterns without counting anything for his years of hard labor. Mr. Plant probably felt at the time in the same frame of mind as Euclid did when he found out that Mrs. Euclid had thrown two of his most precious manuscripts in the fire, but all was of no avail. Mrs. Plant was obdurate and said she had had enough of his nonsense, suggesting that he should go to work. In the fall of 1887 Mr. Plant became general superintendent of the Tiffany Press Brick Co., at Momence, Ill., remaining there until the fall of 1893, resigning his position at that time partly on account of the poor health of the family. In 1894 he was engaged by the New York White Brick Co., to discover the reason of the failure to make good white brick from its bed of splendid kaolin by the dry press process. The trouble was soon located and under Mr. Plant's direction there was soon manufactured by that plant the best white architectural terra cotta that had ever entered the city of New York. This concern is still successfully operating. Mr. Plant remained as general superintendent of this company until 1896, when he was engaged by the receiver of the Staten Island Terra Cotta Lumber Co. to take charge of the works at Woodbridge, N. J. This was quite a large concern, but had proved a veritable white elephant. Mr. Plant, however, revived the spark of life in the business and fanned it to a commercial flame and the court then sold the concern to the highest bidder. The works have since been destroyed by fire.

Subsequently Mr. Plant received a contract for the erection of the works for the manufacture of white brick at Kunkletown, Pa. This brick is specially intended for the New York market and so successful was the work of Mr. Plant that he has recently received a letter from the company telling that there has been drawn an average of 94½ per cent of No. 1 white front brick during the last five burnings of the Plant kiln.

Mr. Plant is now engaged in the reconstruction of the Argillo Works and is building there a battery of Plant kilns. This sketch of Mr. Plant's career reveals a good deal of heavy up-hill work. This has contributed largely to form the genial and sympathetic character of the man, and those who are acquainted with S. J. Plant have ever found in him the clayworking gentleman with a wide practical knowledge and quick analytical perception which enables him to get a ready grip on difficult clayworking problems.

Hewitt Rogers, manager of the Roger Brick Works at El Paso, Tex., has successfully experimented in using oil instead of coal for fuel, and reports that the change has effected a great saving in the operation of the plant.

Water in the Boiler and Out of It.

This abstract of an address recently delivered before the C. P. R. Club at Toronto Junction, by M. A. Chrysler, B.A., will be of considerable interest to our clay working readers. The various boiler troubles that arise are all assignable to some cause and the simple, chatty way in which M. A. Chrysler has handled the subject will assist us materially in the study of cause and effect in boiler problems.

"I shall first consider water outside the boiler. On account of its commonness, water was once called an element, the others, of course, being earth, air, fire. It has long been known that earth is far from being a simple substance, but is composed of a large number of substances; air, too, has been proved to consist mostly of two elements, oxygen and nitrogen, to which must, since 1895, be added argon; fire is believed to be not a substance at all; and I shall endeavor to prove that water is not an element.

"We may approach the question of the composition of water from two standpoints, which may be illustrated thus: To demonstrate the nature of a watch it would be possible to start with a whole watch and take it apart into the wheels, springs, etc., or it would be equally satisfactory to start with the individual wheels and other parts, and put them together so as to produce a complete watch. Let us apply the first of these methods to water, and accomplish what chemists call the analysis of water, that is, break it up into the elements which compose it.

"When a current of electricity is passed through the apparatus before you, a colorless gas collects in each of the two tubes, twice as much gas in one tube as in the other. On applying a taper to the tube containing more gas, this is seen to burn with a colorless flame—this gas is the element hydrogen; the gas present in smaller quantity does not burn, but rekindles the glowing end of the string which is held in the gas—this is the element oxygen. Hence water consists of two substances, and is therefore not an element. Another way of breaking up water is by putting a piece of the metal potassium in contact with the water. The metal spins around on the surface, and the hydrogen liberated from the water burns. In case sodium is used instead of potassium, the hydrogen does not take fire by itself, and so may be collected in a tube and then proved to be hydrogen, for instance, by setting fire to it.

"The reverse process, compared above to putting together the parts of a watch, may be accomplished by putting into a pop bottle of thick glass two parts of hydrogen and one part of oxygen, and applying a taper. A sharp explosion follows, and a minute quantity of water vapor is produced. In order to see the water which we thus make we may vary the experiment by burning a jet of hydrogen under an inverted tumbler, when the hydrogen will combine with oxygen from the air, and the resulting water form as a mist on the sides of the tumbler. This process is called the synthesis of water as opposed to analysis.

"Pure water, as thus prepared, is a colorless, odorless, tasteless liquid, with which you may think yourselves tolerably familiar, but it must be said that pure water, such as the sample before you, is not found in nature; no, not in that cool spring which you sought in boyhood days; not in that well to which the farmer points with such pride—every farmer's well is 'the best well in the township'; not even in the raindrops which fall from the thunder-cloud, though this is nature's nearest approach to pure water.

"Naturally occurring waters may be classed as—1, rain; 2, spring; 3, river; 4, sea water. Of these, the water which falls towards the end of a shower is nearly pure; that which falls earlier is contaminated with ammonia and dust. Spring water derives impurities such as lime, iron, sulphur, from the rocks or soil with which it has come in contact. Thus we have the various mineral waters, and the hard water so common in wells. River water necessarily contains the impurities of spring water, and in addition organic matter from decaying vegetation and animal refuse. I hardly need mention that sea water contains about 3½ per cent of solid matter, mostly common salt.

"The common impurities found in water may now be considered. One of the commonest of these is salt, and this, though harmless of itself, is a bad symptom for water to show, for it generally goes hand in hand with dangerous organic impurities. These are naturally regarded as menacing to health, and it should be borne in mind that a water may be clear and sparkling and yet be entirely unfit for domestic use. If the water contain a suspicious quantity of organic matter, it will in a few minutes bleach a solution of potassium permanganate. This may be shown by placing two glass cylinders on a sheet of paper, filling one with pure water and the other with the suspected water, then adding to each a quantity of the permanganate sufficient to impart a distinct pink color. If the second cylinder loses its color in a few minutes, the water should be condemned. From the decomposition of organic matter ammonia is produced (witness a manure pile), hence ammonia is usually present in impure water; its presence may be detected by the addition of a few drops of Nessler's solution. Even one part of ammonia in a million parts of water may be detected by this reagent.

"Of particular interest to the engineer as well as to the hygienist is the existence of lime in water, producing so-called hard water. As is well known such water uses up a quantity of soap before a lather can be produced, and this property is made use of in estimating the degree of hardness of any water. Another convenient test for hard water consists in adding a few drops of solution of ammonium oxalate; if lime is present in the water a white cloudiness or precipitate is produced. Hardness is of two kinds—1, temporary; 2, permanent. Temporary hardness means that hardness which is removed by boiling, and is due to carbonates of lime or magnesia. We may illustrate its formation thus: Into some lime-water a current of carbon dioxide is led; the liquid becomes milky, but on continuing to pass in the gas the liquid clears up; it now contains carbonate of lime in solution, and is simply artificial hard water. When we boil some of it in a glass tube it turns turbid, and the lime deposits on the tube, off which it may be dissolved by a few drops of acid. We can now understand how hard water is formed in nature. From decaying leaves, etc., the water of a stream becomes charged with carbon dioxide; such water possesses the power of dissolving carbonate of lime, so it takes up the substance from the soil or from the limestone rock over which it may flow. When such water is boiled it loses the carbon dioxide, and the carbonate of lime falls to the bottom of the vessel, as fur in a tea-kettle or as scale in a boiler. The evil produced by such a deposit on a boiler is so great that it has been estimated that ¼ in. of scale wastes 60 per cent of the fuel. Since in Toronto the water supply comes from Lake Ontario very little trouble from scale is experienced, but in localities such as Galt and Guelph, Ont., where limestone exposures are common, the water is quite unsuitable for use in boilers. Though the exact composition of scale varies according to the locality, it generally consists of carbonate of lime, or magnesia, or both; what can be done for it? As with most other maladies, treatment may be in the way of prevention or of cure. In households three methods of prevention are used: 1, boiling; 2, adding lime; 3, adding washing soda. Of these methods of softening water, the second seems, at first sight, altogether unreasonable, but an experiment shows that on adding lime-water to water containing lime, a precipitate of chalk falls to the bottom and the water is made pure. Such a method may be applied to a tank of hard water, the requisite quantity of lime being previously

determined. In order to cure the scale numerous boiler compounds have been used; in many of these tannic acid is the active ingredient, hence the cure eats its way between iron and scale, loosening the latter by attacking the iron and scale, loosening the latter by attacking the iron underneath the coating. What is wanted is a compound that will eat its way through the scale and not attack the iron.

"Turning to permanent hardness, we may illustrate its cause by dissolving in water a little gypsum (plaster of Paris), chemically called sulphate of lime. This liquid responds to the oxalate test, but is in no degree softened by boiling. Permanent hardness is always due to sulphates or chlorides of lime or magnesia. Upon boiling such water for some time the slightly soluble sulphate of lime gradually separates out and settles on the boiler. This bears out an earlier statement to the effect that the composition of scale varies according to locality, so that only an analysis can determine the best method of dealing with any particular case. Permanently hard water may be softened by means of washing soda, but is not affected by addition of lime.

"But water may be quite injurious to a boiler without containing any lime; a complaint has come to my ears that the water from a certain place beyond Hamilton causes much annoyance because of its corrosive action, causing leakage at joints. It has been suggested that this water may contain iron, or perhaps tannic acid, but the former would not act harmfully; tannic acid, if present in such quantities as may be found in parts of the Georgian bay, attacks iron readily, as would naturally be inferred from the remarks made above on its use as scale remover.*

"Turning from the chemical side of the subject, let us consider a few points concerning the boiling of water. It is commonly said that water boils at 100 deg. Centigrade or 212 deg. Fahrenheit. Is this true? Into a glass flask some pure water is poured, and the bulb of a sensitive thermometer lowered into the liquid. When the water boils the thermometer indicates about 101½ deg. C., and remains at this point; if the thermometer be raised into the vapor, 100 deg. is registered. If now some iron filings or a few small cinders be dropped in, the temperature of the boiling liquid falls to 100 deg. Presence of the rough particles seems to aid in the formation and loosening of the bubbles of vapor at the bottom of the flask. In accordance with this, it is found that water boils at a lower temperature in a vessel of copper than in one of glass. If some salt be added to water the boiling point is raised 2 deg. After performing these experiments before a junior class in physical science, the writer said to the class: 'It is a well-known fact that the water in a locomotive boiler is at considerably above 100 deg.; why is this?' One pupil suggested 'presence of impurities,' evidently thinking of the experiments previously made; another considered rust to be the cause; finally a pupil ventured the opinion, to as a matter of experience, that the increased pressure in the boiler kept the vapor from rising until the temperature was raised much above 100 degs. It has, in fact, been determined that at a pressure of 2 atmospheres, or 30 lbs. to the square inch, water boils at 120 degs., at a pressure of 15 atmospheres, water boils at 200 degs.

"It is easier to show the lowering of the boiling point caused by lessening the pressure: A glass flask is half filled with water, and this is boiled until the upper part of the flask is filled with steam; the mouth of the flask is now tightly corked, and the flask inverted over a basin. If now some cold water is poured over the flask the water within boils vigorously, and may be kept boiling until cool enough to be held in the hand. This paradoxical result is due to the condensation of the steam in the upper part of the flask, causing a partial vacuum; therefore, the water is under very slight pressure, and boils at a low temperature.

"Everybody has seen water dropped on a hot stove dancing over the surface in the form of spheres until the edge of the stove is reached; also, we know that if the stove is not very hot the drops behave quite differently, resting on one place and turning into steam. To examine into the curious behavior of the water in the first instance, a disk of brass slightly hollowed out on the upper surface may be used. If this is heated nearly to redness, a spoonful of water may be placed upon it without any sign of boiling. This assumes the form of a much flattened sphere or spheroid, rolls about rather uneasily on the brass, and gradually becomes smaller through evaporation. If the brass is allowed to cool, nothing happens until the temperature falls to a certain point, when the water suddenly commences to boil violently, and is in a few seconds turned into a cloud of vapor, leaving the brass perfectly dry. By a proper arrangement it may be actually seen that the large drop does not touch the brass disk, and this fact may be proved in other ways. Why is this? The old explanation was that the spheroid rests upon a cushion of steam, and is thus preserved from contact with the metal and consequent boiling. But why does this steam not escape at the sides of the space, causing production of more steam and a rapid lessening in size of the spheroid of water? A later explanation is that the spheroid is supported by a Crooke's layer of steam, in which the particles of steam are rapidly dancing up and down between metal and spheroid, thus keeping the two apart. This spheroidal state of water has frequently been assigned as a cause of boiler explosions, and many arguments have been advanced pro and con. I shall close with the suggestion that this matter be discussed."

*The writer has since been furnished with a sample of this water, and finds large quantities of organic matter (vegetable) present; such matter, when heated, has a highly corrosive effect on iron. The peat bog from which this supply is drawn is well-known to the writer, and is an entirely unsuitable source of supply.

Why Wedgewood Ware Collectors are Scarce.

There was a time when collectors of Wedgewood ware were very numerous, but at the present time there are very few who are collecting Wedgewood ware alone. One does not have to go far, however, to find good reasons why these conditions exist. Prices of old Wedgewood ware are, as a rule, very high and really genuine pieces are exceedingly hard to get hold of. However, when we go into the details of the matter, no English potter is more worthy than Josiah Wedgewood of all the honor that can be given him, as he was incontestibly the greatest of English potters. One of the noticeable features of Wedgewood ware is the fact that out of all the numerous varieties and pieces of ware turned out by him, not one of them could be called ugly. Wedgewood ware was the most beautiful of all English art ware, his modeling was a lesson in form and his art classic. Wedgewood ware and "old Wedgewood" are two distinct classes. In fact, a thing that the potter himself was wont to insist on. Under the latter mention comes the well-known "Queen's" ware, which is of a rich cream color and which is covered with a wonderfully soft and mellow glaze. It gained its name through the approbation of Queen Charlotte, to whom Wedgewood presented a dinner service, and from that time forth its success was assured. In fact, it became a fashion. Some collectors confine their collections to the Wedgewood cameos, which are composed of a series of blues, greens, etc., in which the figures are embossed or raised, and which are left in the plain white. The effect is beautiful and of added interest if the embossed figures are portraits of celebrities. However, different minds run in different channels, and many collectors' views are that a piece in which the utter plainness and purity of rotundity and outline is even more beautiful than elaborate decorations.

Pottery News.

The Universal Sanitary Manufacturing Co., maker of sanitary pottery at New Castle, Pa., is erecting a new sagger kiln. The company has in the past been buying all of its saggers. The new kiln will be ready for use the first of June.

The Thompson Pottery Co., at East Liverpool, O., is erecting several new kilns and some decorating kilns.

It is reported that one of the largest potteries now in Trenton will soon discontinue the manufacture of table ware to go into the manufacture of porcelain bath tubs. This class of tubs is fast becoming the standard, and as there are only three manufacturers of these goods in the United States, the opening seems to be particularly good at this writing.

The project of erecting a monument to that well-known American potter, John Harry Brewer, has taken hold of not only the "boss" potters of Trenton, but also the employes. It is more than likely that the monument will be erected, and if it is, it is probable that it will be located in what is known as Monument Park.

The contracts have all been let for the erection of the new Buffalo pottery, to be built at Buffalo, N. Y., by some of the stockholders of the Larkin Soap Co. of that city. The contracts for the buildings and kilns, the machinery, and, in fact, the whole pottery complete, have been let, and the plant will be erected just as soon as possible. The plant will be a nine-kiln concern and will be up-to-date and modern in every particular, no necessary expense being spared in its erection.

The Atlantic Kaolin Co. has been incorporated in New Jersey with a capital stock of $100,000. The company will establish a kaolin plant at once in upper Florida, where the deposits are said to be extraordinarily rich.

It has been learned that the Eureka Flint & Spar Co.(of Trenton, N. J., is not in the new combination of flint and spar grinders recently organized under the name of the Golding & Sons Co. The organizers of the new concern are Berker Gummer, W. S. Hancock and H. H. Hammill. It is probable, however, that the new combination have had some understanding with the Eureka people.

The Barberton Pottery Co., which has just erected a new pottery at Barberton, O., has recently completed 20 new dwellings, which will be rented to the employes.

The Peters & Reed pottery at South Zanesville, O., is making several installations in the way of new clay-washing machinery. The repairs will be completed within the next few days.

The new pottery recently erected at South Zanesville and which is known as the Elite, was in operation May 15th. The plant is a four-kiln one and is owned by L. E. Diehl, John Bryan, Samuel Benson and G. W. Page.

The plant of the J. B. Owens Pottery Co., which was recently destroyed by fire at Zanesville, O., is being rebuilt as fast as possible. The entire plant was destroyed. Only the kilns were left standing, and all the buildings and machinery will be new throughout. The new plant will be up-to-date in every particular. The concern is, at this writing, making all of its ware at the plant of the Ohio Pottery Co., which is located just across the street. The ware is then carried across the street and fired in the company's own kilns and is then taken back to the other works to be packed. This method of handling probably cuts all of the profit out of the output, but the company is trying to keep its own trade at least partially supplied.

The Wallace & Chetwynd pottery at East Liverpool, O., is erecting several new decorating kilns which will be completed within the next three weeks. Other additions are probable.

The American China Co., at Toronto, O., is making extensive improvements in the clay-working department.

Extensive repairs have just been completed at the Peoria works of the Crown Potteries Co., which are located at Peoria, Ill. The company is also improving the plant throughout.

The new pottery which is being erected at Crooksville, O., will be in complete operation by September 1st. The models for the ware to be made by the new pottery are now being made.

The plant of the Lyons Pottery Co., at Lyons, N. Y., will resume operations shortly. A new company, headed by W. H. Eagan and W. H. Scott, has taken charge of the new plant and will start it up immediately.

It is probable that nothing will be done now regarding the new pottery which was to have been erected at Columbus, O., by the Bell Pottery Co., of Findlay, O., since the death of Mr. W. M. Bell. Mr. Bell was at the head of the new concern, and it is doubtful whether Mr. Bell's brother, Mr. Edward Bell, and the others interested in the formation of the new company, will carry the movement through or not.

The Electric Porcelain Co., of East End, East Liverpool, O., and which has been in existence something short of a year, is making a wonderful success with the sale of its goods. At the outset the plant had but one kiln, which was devoted entirely to the manufacture of wiring tubes. However, later on, one more kiln was erected and later a third kiln. The company will begin at once the manufacture of dry pressed goods such as insulators, cleats, rosettes and all kinds of special electrical porcelain.

The Ohio River Sewer Pipe Co., of Empire, O., has been incorporated under the laws of Ohio by J. C. Bigger, W. B. Stratton, H. B. Stratton, J. S. Casey and C. M. Stratton. Of these J. C. Bigger has been elected president; C. M. Stratton, vice-president; H. B. Stratton, manager, and J. S. Casey, superintendent. No new works have been erected. The incorporation is simply the reorganization of the old firm of Stratton Bros., who have operated the Ohio Valley works for some years past in a successful manner.

The capacity of the Ideal plant of the Trenton Potteries Co., Trenton, N. J., will be increased shortly. This plant is one of the two operated on table ware alone by that company. The others all being run on sanitary goods only.

Owing to a dispute regarding the prices being paid for pressed ware 52 pressers quit work at the Keystone pottery in Trenton some days ago, and at this writing are still out.

There is some talk of a combination being formed between several Ohio potteries, but just which are the concerns interested could not be learned. Whether the action will be successful is a question, but it is not improbable that at least some of those interested will go into a combination.

The Under-Feed Stoker Co. of America, with general offices at 839-842 Marquette Building, Chicago, has recently closed contracts to furnish Jones under-feed mechanical stokers to the following: The Arnold print works, North Adams, Mass., (second order); the Chicago University, Chicago, (second order); the Brilliant pumping station, Pittsburg, Pa., the St. Paul (Minn.) Gas Light Co., the Cocheco Manufacturing Co., Dover, N. H.; the Peerless Rubber Co., New Durham, N. Y., (second order); the Will & Baumer Co., Syracuse N. Y., the Calvert Lithographing Co., Detroit, Mich., and Williams Brothers Co., Detroit, Mich.

The Delaware Clay Manufacturing Co., of Dover, Del., whose large plant has been idle for a considerable time, has been reorganized and will resume operations with an output of 20,000 brick per day. New kilns are being erected, and other improvements made. Alexander M. Daly, of Dover,, is principally interested in the reorganized company.

Montello Brick Co., Reading, Pa.

One of the most interesting plants for the manufacture of bricks in the entire world is the Wyomissing factory of the Montello Brick Company, at Reading, Pa., where the regular and consistent output is 100,000 red shale bricks per day of ten hours, regardless of the conditions of the weather. The term "factory" is used advisedly in describing this plant. When one refers to a brick yard the picture that presents itself to the mind's eye is of an antiquated affair entirely in the open and subject to the freaks of the elements. At Wyomissing the work goes on rain or shine without the slightest interruption. Brick men will appreciate the advantages of a system which makes this not only possible, but entirely practicable.

The Wyomissing factory of this company represents an outlay of $250,000.00. They began operations January 1, 1900, and owing to the wise foresight of the managers in laying out the system and bringing into service the latest and best labor-saving devices, the first year's returns show the handsome net earning of 10 per cent.

FIG. 1—GENERAL VIEW OF FACTORY.

The factory of the company is located at the Wyomissing station of the Philadelphia & Reading railway, just on the outskirts of the city of Reading. Immediately adjoining, they own a bed of the finest shale to be found anywhere. Extending over 55 acres and with an average depth of 100 ft., it is figured that their shale supply is sufficient to continue their present daily capacity of 100,000 bricks for 100 years, and that they can secure this shale without going below the level of their factory floor for at least fifty years.

The bank from which they are digging at the present time is from 35 to 55 ft. in depth. In substitution for manual labor this digging is performed by a steam shovel, having a dipper of 1¾ cu. yd. capacity. The crew of this shovel consists of about eight men, including the engineer, fireman and cranesman. It has been conservatively estimated that 40 men would be required to perform the same work with pick and shovel under favorable weather conditions. The shovel requires a working face of less than 50 ft., whereas about 240 ft. would be required to allow sufficient space for 40 men to swing picks. In the event of a snow storm or heavy washing rain swamping the tracks, the time saved in cleaning up a 50 ft. as compared with a 240-ft. space, is, in itself, an item of no mean consideration. The shovel and bank are shown in Fig. 2.

The steam shovel delivers the shale to side-dumping cars of sheet-steel construction, having a capacity of 2 cu. yd. each. The tracks, on which they run, are so arranged and the car supply so regulated, that the shovel is never idle for want of a receptacle. After receiving their load the cars run by gravity on a complete and well-constructed system of narrow-gage tracks to the outside of the factory, a distance from the present location of the shovel of about one-quarter mile. At the end of this journey it is necessary to elevate them to a vertical height of 16 ft., which is accomplished by a continuous chain car haul, with lugs attached to the chain at intervals of about 30 ft. These lugs, or hooks, engage the axles of the cars and carry them quickly and steadily to the second floor of the factory. This up haul is shown on the right in Fig. 3; to the left in the same figure will be seen the down-haul, which is of similar construction to the up-haul, and serves to return the empties safely and without shock to the ground level.

After reaching the second floor the cars are guided by rails and ball-bearing turntables (see Fig. 4), alongside one of the four hoppers, into which the fresh shale is dumped and chuted to one of the eight dry pans, which are arranged in two rows on the floor below. These dry pans are the usual type and are manufactured by Phillips & McLaurin, of Pittsburg. The rolls reduce the shale to a sufficient fineness to admit of its passage through an eighth of an inch mesh, the finely-ground shale being chuted by gravity to a horizontal drag chain or conveyor located between the two rows of dry pans. This conveyor, in turn, takes the material to a central opening in its trough, through which the shale is delivered to an open top "Link-Belt" carrier (see Fig. 5), by which it is conveyed to an elevation of 80 ft. and discharged into a chute leading to the Gery patented screens. As all brick men know the screenage of brick-making material is probably the one greatest cause of tribulation connected with that industry (at factories compelled to screen their material), owing to the difficulty that has obtained in securing a screen to per-

form its office with either wet or dry material. The screens in use at the Wyomissing plant are the invention of Mr. A. A. Gery, general manager of the Montello Brick Company, and are the result of much thought over the problem.

The pebbles or lumps too large to pass through the screen are returned by a simple chute to the dry pans for recrushing, while the screened shale passes to a bin located over the pug mills. This bin

FIG. 2—SHALE BANK AND STEAM SHOVEL.

accommodates sufficient shale for making 100,000 bricks, the daily capacity. Its use saves the possibility of stoppage of the brick-making machines should the steam shovel or any other machinery upon which the brick making depends break down or have to be shut down for a day's overhauling. The shale feeds from this bin to the two pug mills below, which are of the Chambers type. Here another innovation is encountered in the use of hot instead of cold water for mixing purposes. Hot water makes the bricks more plastic and unites the smaller particles to a greater extent than cold water. Here also is an unusual economy, for the hot water used is the condensation of the exhaust from the main engine that runs the factory, which under less ingenious management, would be allowed to pass into the open air as waste.

The thoroughly mixed mass passes from the pug mills to the stiff-mud machine located immediately underneath, where it is compressed and forced out as a bar through a 4⅜x8⅞-in. die. There are two of these stiff-mud machines, of course, one for each pug mill. The bar of mud passes along a rubber belt for about 20 ft., the pressure of the load on the belts producing sufficient energy to operate the cutting-off machines, of which there are two, which have a cutting capacity of 80,000 bricks per day. These two machines having a capacity of 60,000 per day in excess of the other machinery, there is latitude for the enforced stoppage of either the one or the other without disturbing the capacity of the other machinery or facilities. The cutting-off machines can be described as wheels 8 ft. in diameter, with small wire spokes, the revolutions of the wheel being so timed that a wire spoke will strike and sever the mud bar at every 2½ inches of its advance. This method of side-cutting instead of end-cutting, has two advantages; first, it leaves a smooth surface on the exposed portion of the brick, and, second, builders say that the slightly rough surface left by the wire blade permits a quicker and firmer adhesion between the mortar and the brick.

Leaving the cutting-off machines the soft bricks are carried a distance of 20 ft. by an off-bearing rubber belt. Here men remove by hand and place the perfect bricks on dry cars standing on convenient tracks, while any imperfect bricks are thrown into a trough located between the two belts and are returned by a circular flight conveyor to the pug mills for reworking. The racks or dry cars hold 600 bricks each; 700 of these cars are in constant service at Wyomissing. After receiving their load of green bricks the cars are switched upon an elevator, which holds two cars and has a capacity for raising six tons. This elevator is operated by steam pressure, being of the type manufactured by Craig, Ridgway & Co. It carries the loaded cars to the third story of the factory, where the dry tracks are located. There are 15 of these tracks running the entire length of the kiln, which is 524 ft. They accommodate 650 cars of bricks in the drying process at all times. The drying tracks are divided into two sections. On the first section there is a coil of steam pipes laid between the rails, which receive their supply of steam from the exhaust of the main engine. The condensation of this steam is run back to the feed water heater, where it performs the further service of heating water for the boilers and brick making; it is then pumped to the various places where needed. This system of pipes furnish heat to prepare the bricks for the hotter portions of the dry tracks, which is enclosed in order to retain the hot furnace heat. Movable doors separate the steam section from the hot-air portion of the drying tracks, which operate on the storm-door idea and thus conserve the heat by preventing an open draft of cold air from passing directly through the hot-air room while cars are being shifted in or out.

The location of these drying tracks in the third story, over the kiln, is unique, and in the summer enables them to dry the bricks entirely by the utilization of waste heat. This is the heat that naturally passes up from the kiln, waste heat from the boilers and exhaust from the engines. In winter, however, it is necessary to supplement this with heat produced by two individual furnaces located on the top of the kiln and immediately underneath the hot-air section of the drying tracks. A Sturtevant fan located alongside each furnace not only serves to distribute the heat from the furnace throughout the drying tracks, but draws heat from the chambers of the kiln where bricks are cooling, which is also utilized as a drying agency. The drier is built entirely of iron and

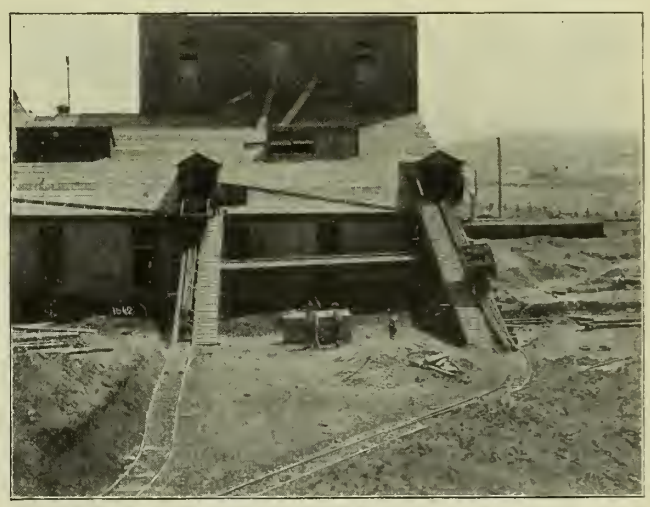


FIG. 3—CAR HOUSE.

brick so that there is no danger from fire. The brick columns which support the driers are so constructed that they are not in any way affected by the expansion and contraction of the kiln.

A system of wire rope haulage saves much time and labor in shifting cars of thoroughly-dried bricks from the drying tracks. By its employment one man can move 100,000 bricks by merely shifting the clutch lever. With the use of manual power it would require eight

men eight hours to clear and refill these tracks, to say nothing of the loss of heat that would result from keeping the doors of the hot room open for this length of time.

Twin elevators or lowerers are used for taking the cars of dried bricks from the third to the first story, where they are switched to any predetermined room of the kiln for burning.

The kiln itself is of the continuous type, 524 ft. in length, and of

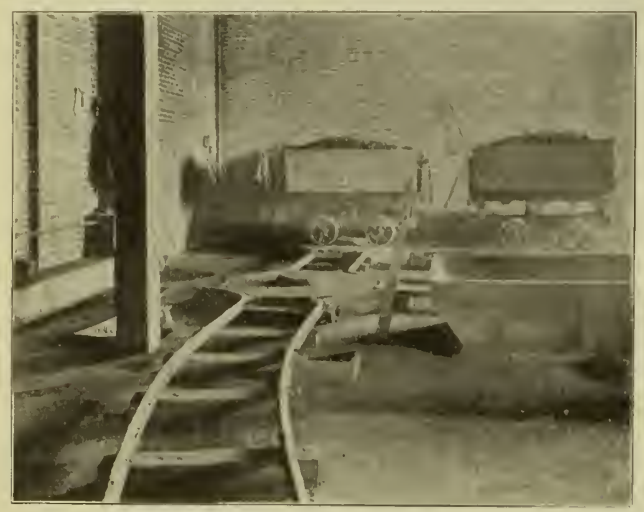


FIG. 4—TRACK, CARS AND TURNTABLE.

oval shape. It has the largest capacity of any kiln in the world, 2,000,000 bricks being under the fires at all times, besides the capacity of the cool rooms which are being filled and emptied. It is divided into 36 compartments, each accommodating 40,000 bricks. Three separate fires heat 18 compartments, 5 being fired up, 5 under hot fire, 5 cooling and 3 cool enough for unloading and setting. The fires have been burning without stop since November, 1900, when 350 cords of wood and 200 tons of coal were required to start them. The enormous saving by never letting the fires die out is obvious. Bricks just set in the kiln are furnished with heat

FIG. 5—SHALE ELEVATOR. FIG. 6—COAL ELEVATOR.

from the boilers, sent in by a large Sturtevant fan through special flues under the kiln. These flues are large enough for a man to walk through without stooping.

Five cars of coal are consumed at this plant per week. It is received in bottom-dumping cars which deliver to a track hopper; from the hopper the coal flows to a "V" bucket elevator attached to two strands of chain (see Fig. 6), which elevates the coal to a height of 43 ft. and then conveys it a distance of 55 ft., where it is deposited in a bunker located convenient to both the boilers and kiln, having a storage capacity of 12 carloads.

The plant is provided with excellent shipping facilities, being located immediately alongside the Columbia branch of the Philadelphia & Reading railway. It has two tracks, one in the west, and another in the east side of the factory, both under cover and each holding about 20 cars.

The car hauls, ball-bearing turntables (19 in number) continuous-running elevators and conveyors were designed and manufactured by the Link-Belt Engineering Co., of Philadelphia.

The complete factory was constructed according to the plans of Mr. A. A. Gery, general manager of the Montello Brick Company's several large plants, with the assistance of his brothers, F. S. and William A. Gery, superintendents at Wyomissing and Montello, respectively.

The Messrs. Gery are brick makers of experience, having, prior to the construction of the modern Wyomissing factory, successfully operated the old Montello works, which are also located near Reading, and are still in operation for the manufacture of fire and street paving bricks, while the plant at Wyomissing is devoted to the making of building brick exclusively.

The Savage Fire Brick Co.

The stock of the Savage Fire Brick Co. was purchased on April 10th by Scott Dibert, John H. Waters and J. W. Wagoner, of Johnstown, Francis Torrance, of Pittsburg, and W. S. Ravenscroft, of Ridgway, Pa., each purchasing a fifth. A previous report to the effect that Messrs. Haws and O'Connor were intertested was erroneous. The value of the property is nearly a half-million dollars. Mr. Ravenscroft's new plant at St. Mary's, Pa., commenced operation on May the 5th with a 20,000 daily capacity. The title of this company is the Elk Fire Brick Co., Mr. Ravenscroft being president. The combined output of the Savage Fire Brick Co., Elk Fire Brick Co., Dagus Brick Co., and the Mt. Union Silica Brick Co., approximate 60,000,000 brick annually, which entitles them to consideration as a powerful factor in the brick manufacturing industry. Mr. Ravenscroft is also vice-president of the Dagus Brick Co.

Write to Us Today.

The Australasia Budget, an Australian paper of some note, commenting on the necessity of wakefulness on the Empire's part to the foreign invasion of trade, lapses with some ingenuity into poetry which we reproduce here as being peculiarly applicable to those who have as yet not made up their minds to subscribe for or to advertise in "Brick." The rhyme runs as follows:

My friend, have you heard of the town of Yawn,
On the banks of the River Slow,
Where blooms the Waitawhile flower fair,
Where the Sometimeorother scents the air,
And the soft Goeasys grow?
It lies in the valley of Whatstheuse,
In the province of Letherslide;
That tired feeling is native there,
It's the home of the listless Idontcare,
Where the Putitoffs abide.
The Putitoffs smile when asked to invest,
And say they will do it to-morrow;
And so they delay from day unto day,
Till death cycles up and steals them away,
And their families beg, steal, or borrow.

Burning Brick With Oil.*

BY GEORGE H. DREW, BLUE ISLAND, ILL.

The first use of oil as a fuel for burning brick was by Mr. F. H. Eggers, of Cleveland, O., a former president of your association. This was in the summer of 1888, and was followed a few weeks later by the May, Purington & Bonner Brick Co., and the Purington-Kimbell Brick Co., of Chicago. As I was with the latter company during the seventeen years of its existence, it naturally follows that it was with that company that what experience I have had was obtained.

In five years from the date of Mr. Eggers' first experiment the use of oil as a fuel for burning brick had increased to such an extent that in 1893 the Standard Oil Co. sold more than 400,000 barrels in Chicago alone. At this point the philanthropic zeal of the Standard Oil Co. seemed to wane, and its desire to benefit mankind, and especially that portion of it engaged in making brick, received a serious set-back. The quality grew poorer, the price increased, with the result that in 1901 less than 50,000 barrels were used in burning brick.

Next to gas, oil is the ideal fuel for burning brick. Nearly all the potteries and terra cotta works use it. Not altogether because of its cheapness, but largely because the quality of all clay products is greatly improved by this method of burning. The principal reason for this improvement lies in the fact that from the time the kiln, or furnace, is lighted until the burning is finished, no cold air is admitted, and the damage done to ware by changing fires, when coal is used, is entirely overcome.

To make a success of burning oil it is necessary that the burner should know the proper quantity of oil, air or steam, or air and steam, and how to mix it. The average brickmaker finds this out by practical experiments. The scientist might get at the same more quickly and perhaps more definitely, but the practical burner would produce the best results.

The first kiln I burned with oil was an old-fashioned clamp kiln of ten arches at the plant of the Purington-Kimbell Brick Co., at Purington Station, near Blue Island, Ill. This kiln contained 350,000 common brick, and was burned in ninety-eight hours, using 8,750 gallons crude oil. The burner was a patent affair from Haverstraw, N. Y. I have tried nearly every style of burner I could get hold of, and finally came to the conclusion that the old-fashioned Canada burner, with some slight changes, was the best adapted to our use, and for years have made all the burners that we used and many used by others. It is very simple in construction, and is made of gas pipe, using ¾-in. pipe for the steam, and ¼-in. pipe for the oil. We have burned many millions of brick. Our average time during the past season was 82 hours, and average amount of oil per thousand brick 22½ gallons.

Our oil is stored in a brick cistern, and pumped to a stand-pipe 35 ft. high, with an overflow to the cistern. This gives us an even pressure of oil at the burners, which is very necessary. The steam is taken from the boiler plant, 250 ft. from the kiln shed. It goes without saying that the value of the steam is not increased in traveling from 250 to 800 ft., and to remedy this we run a 2-in. pipe to the center of the kiln, in the second arch from the end. This acts as superheater, and is the simplest and most efficient of any I have tried. The economy of burning oil is greatly increased by the superheating of the steam used to spray the oil. At the present price of oil brick can be burned much cheaper in Chicago with coal, so far as fuel is concerned, but on some of the yards owned by this company the additional cost of fuel, when using oil, is more than overcome by the reduced cost of labor and quality of burned material.

I hardly think that I shall be criticised by the practical men of this convention for saying that clays differ greatly, and that there are many things to be considered in figuring the cost of burning. I am sure that with the clay I have used for the last sixteen years brick can be burned with oil to produce a much better quality, and with much less waste, than with wood or coal, and yet this is not true of all the Chicago clays. Some of them can be burned with coal at a little more than half the cost of burning ours with oil, and their equal in quality. There is less danger of a poor burn with oil than with coal in burning such clay as I am used to, and there is certainly much less anxiety for the burner and superintendent, and more certainty of good results.

Many have asked me about the danger in using oil as a fuel. In reply I can say that in the thirteen years we have used it we have never had an accident. With ordinary care, oil is as safe a fuel as wood.

I did not expect, when I began, to write one-fourth as much as I have. Like the fuel I advocate, my efforts to explain its use are crude. If those who have listened, and are interested in this subject, will spend a day with me at the works, I will try to explain more fully than I can here the practical workings of our system of burning brick with oil.

*Read before the 16th Annual Convention of the N. B. M. A.

Modern Brick Plant Prospecting and Construction.*

BY FRANK W. BUTTERWORTH, DANVILLE, ILL.

It was the custom some years ago, as you will probably all remember, to celebrate the advent of a new year by making a more or less extensive round of calls, the number dependent, to a considerable extent, upon the capacity of the caller, as it was considered only good form to offer all kinds of liquid refreshments. In comment upon this the humorist, Bill Nye, wrote to a friend something like this:

"New York, Jan. 2, 1890.

"I made some New Year's calls yesterday—I am told."

I fear greatly that some such remark as this will be applicable to me after you have all had your fling at this paper, and I will go home and tell the boys at the works that probably the official stenographer has a record of what I said, but surely no one else will remember it, as almost any remarks upon so broad and comprehensive a subject cannot help but produce adverse discussion, and it is with fear and trembling I approach it.

Manufacturing conditions in our glorious country have been changing rapidly during the last decade. Formerly capital was chary of the industrials. Few manufacturing stocks were listed upon the exchanges, and nearly all of the successful concerns grew from small beginnings. Now capital is seeking investment in large chunks. Instead of using last year's earnings to make this year's increase, it is easy to secure new money for projected improvements; and today, owing to the opening of new markets, the best financiers of the country are eagerly buying the shares they formerly thought risky. In our business much the same changes are taking place. Owing to the almost exclusive use of the older deposits of shales and clays, which usually occur of great thickness and extent, increased permanency is added to an investment in clayworking industrials. As the surface clays within easy hauling of the cities are rapidly becoming exhausted, more brick each year are transported by large carriers, and, as a natural result, a more extensive business area becomes accessible. Instead, therefore, of being content, as most of us have, with either commencing in a small way with a trifling investment, and from thence, after practically testing material and market, growing into a large works, the time is right here when we are as a beginning, instead of an ending, building extensive plants, representing a substantial investment, without years of preparation in that particular location.

It is because of these conditions that a few remarks upon prospecting—that is, the proving in as conclusive a way as possible to the satisfaction of the practical man, and to capital as well, both the character and extent of a deposit of workable material—seem in order at this stage of our industry's progress.

Bearing in mind that the wrong material means almost total loss to investors (What is a brick plant worth to move?), that as our process of manufacture is an exceedingly long one, and that in a large plant a vital mistake at the beginning means probably a month's product made and spoiled, a year's profits lost before it is discovered. From the very bottom of my heart and for the good of the trade in general, I say: "Let the brick works prospector choose for his watchword 'Caution,' else that awful, borrowing, soul-wrecking first kiln will be a hideous nightmare."

See the red flag of danger everywhere, shut the eyes to the good points—they will force themselves into notice if they are prominent enough—dig, drill, hunt, test for the injurious points in an investigation, whether of material, market or means of reaching it.

A man with ample capital at his command, and who has had years of practical experience—none others should apply—is looking for a location for an extensive clayworking industry; his first requisition is for a map showing line of transportation, his next for a State geological report. Having selected a point with good shipping facilities, preferably in the center of a prosperous and growing community or close to an increasing city, and where the stratification, as shown by his State geologist, gives promise of the material he is after, he starts out.

His first tramp is directly along the line of transportation perhaps a few minutes' walk will bring him to a deep railroad cut, exposing a shale or clay in which he is interested. More often, however, he finds the first indications in the lowest possible levels; that is, the water courses. A sharp bend in the creek or river makes a strong current, which keeps the material clean and free from surface washings. Often he finds in these lower levels, like the mineral prospector, flakes of sandstone, small pieces of partly disintegrated shale, broken concretions of kidneys of iron burst by the frost or exposure to the weather, and then he knows that somewhere above him, perhaps hundreds of feet, is the stratum he is after, for the material follows nature's law and travels downward, never up. It may be, or rather it is very likely, that weeks and months are spent in fruitless search. Then another territory is tried; but, presuming that he is successful at last, a seemingly heavy vein of material is found close to transportation, surface indications are excellent as to its accessibility without burdensome stripping, a level tract is adjacent suitable for a plant, an average sample of the outcrop is submitted to the chemist for analysis, and, nothing injurious found, the property is cautiously optioned for as long a time as possible and the careful, painstaking series of tests begin—one for quantity and one for quality. The former, by far the easier, for a few drill holes or a week or two sinking shafts, together with a few days' work of a civil engineer running levels, will enable the prospector to make an accurate chart showing within a very few inches the thickness of the overlaying material, as well as the thickness and extent of the workable straum. In these days of concentration of business into large units the Ohio farmer's suggestion as to the purchase of land is quite apropos. He said: "While you're gittin', git a plenty"—for the plant ought to grow, and no doubt will.

Then commences the test for quality, and it seems that no matter how carefully this is conducted, if the stratum has never been worked there is always an element of uncertainty present with the conservative man conversant with what may happen. The more knowledge the more caution, and, from the varied experience of several careful investigations, I offer for the consideration of this convention the following practical suggestions:

The outcrop of a vein of workable material having been exposed to the weather, marked physical, if not slight chemical changes, distinguish it from the solid formation, and as a large plant will exhaust this in a few months, in testing it is always preferable to avoid the exposed portions of the stratum. The method of ultimately procuring the raw material having been decided upon from the surface indications and from drill holes and shafts, the sample taken for test purposes should approach as nearly as possible to the material which will be worked commercially. All strata vary at different depths, to some extent at least. Hence, if it is the intention to work the entire deposit, as, for instance, with a steam shovel, it is advisable, regardless of expense, to take samples from all depths. Nearly all the machine concerns have complete testing rooms. I might add they have experts in the manufacture of samples in charge of them, but, without any disrespect to them, it should be borne in mind that their object is to always make the best ware possible. The prospector should be anxious to bring out the bad points to the material under consideration; hence it should be prepared coarser than ordinary, dried faster than usual, and when burned should be subjected to not only the medium temperature of the kiln, but also to the most and least intense heat, and to the flash of fire. After having exhausted every known test, and brought a fresh and critical brain to bear upon the samples, every thing looks promising, the risk is at a minimum. But yet there is still a risk—a risk of the perfect uniformity of the deposit, much less in the old than in the recent formations; a risk that the ware contiguous to the test samples has influenced them, that the workable conditions have not been strictly adhered to, and so on ad infinitum. The element of uncertainty is always there to the cautious man, although he usually loses sight of it during the construction period, for he needs all his energy in the quick dispatch of the multitudinous details incidental to the prompt erection of the works, and this brings us to what, I think, may be safely stated as the most important branch of the clayworker's education that is, the cheap and permanent construction of a plant which will manufacture, in the most economical manner possible, the product which will best suit the needs of the available market.

In no other industry today is there so much diversity of opinion in the general plan, as well as the detail of an extensive brick plant. This is quite natural, because of the great variety in, first, the nature and situation of the raw material to be worked; second, the available space for the plant proper; third, the climate of the location; fourth, the cost of fuel, and fifth, the demands of the market. Each or any of these may make a radical departure from the general plan of another established plant highly successful, hence any remarks upon this subject must of necessity be very general.

In the planning of a plant the aim obviously is to manufacture the largest percentage of strictly No. 1 ware as economically as possible, and still keep the investment so small as to allow the payment of returns. The time is right here, owing to the increased factor of permanency in our plants, when it is good business in a clay industry to seriously consider any device which will annually save by its installation anything over the customary interest rate of 6 per cent, and, under such conditions, it becomes necessary for the brickmaker to look around for those improvements which ten years ago he would scornfully have turned down as "frills." With the prevalence of such ideas comes the possibility of solid fireproof construction, embodying the best engineering skill of the country, and it is upon such ground as this that "modern brick plant construction" must be discussed.

The brickmaker's raw material costs him usually so little that we may say it is free. The process of manufacture is complete in itself. The two elements in economy of operation to be considered are labor and fuel. Labor consists of the handling and rehandling of the material in one form or another by human hands, hence the highest economy is obtained when the number of these reaches the

minimum, which is usually accomplished by the substitution of machinery as nearly automatic as possible. Supposing 100,000 brick daily are to be manufactured, weighing 6 pounds each, the average number of times they are to be handled is about thirteen. This means that 3,900 tons of material daily must be lifted from one place and deposited in another. One handling saved means nearly 8 per cent increased earnings. The crude raw material, by the use of steam shovels and the most improved conveying apparatus, can be dug, no matter how hard, and carried with but little labor, and when possible it is advisable to make but two elevations—one of the raw material by means of the incline from the clay bank, in order to automatically feed the grinding apparatus, and one after pulverizing by means of elevators, in order to feed with a minimum expense the molding machinery. Up to this point in the manufacture it seems that the substitution of mechanisms for human labor has about reached the limit. In comparison with that formerly employed, the saving is enormous. From this on the builder's chief study should be to handle the product, which has now taken the form of finished ware, not only the least number of times, but also in large units, and to take advantage in so much as possible of the great force of nature so freely bestowed, that is, gravitation. A few moments' thought convinces any one of the economy of arranging the driers, kilns and final carriers in such a way that each shall be contiguous to the other, and so that the enormous daily weight to be transported shall all go down a gentle incline from the machine to the point of delivery of the finished product. It seems to me that the very acme of perfection in brickmaking will be attained when this entire process becomes a continuous one; that is, when the green brick leave the molding machinery and pass through an increasing temperature, coming out close to their final point of delivery as cool finished product, without having been touched by hand. This, at present, is a long way off, yet the nearer it can be approached in the construction of a plant the more economical will be that plant's operation.

The majority of discussions among brickmakers are devoted to the second element of expense in manufacture—fuel. For convenience we will subdivide this important subject into "Fuel for Generation of Power" and "Fuel for Burning and Drying Ware." To the first the best engineers of the country are, and have been for years, devoting their best efforts. Endless opinions have been promulgated, and we brickmakers can well afford to let them thresh this out on their own floor, satisfied to take and use the results of their exhaustive experiments. The second division, however, belongs exclusively to the clayworking fraternity, and we must find out for ourselves the best appliances for the economical generation of heat from fuel and its utilization in the most economical manner consistent with the production of the largest percentage of first-class ware.

To the uninitiated it seems as though the mechanical appliances in use in other industries for securing the most perfect combustion could be utilized in clay works, but the conditions are peculiar. The changes must be brought about very slowly. First, the physically combined water, then the water in chemical combination must be driven out before the temperature can be brought to the degree necessary to change the various ingredients to such an extent as to produce a knitting together sufficient to stand the destroying action of the weather or the abrasive effect of the heaviest traffic. It must not only be a gradually increasing heat from perhaps 100 to 1,800 or 2,000 degrees, but also a gradually decreasing one. For that reason alone the question of mechanical stokers, usé of powdered coal and the other scientific means of burning fuel must be discarded. The aim of the brickmaker, for use in kilns, must be for a simple device to secure perfect combustion; cheap, because of the large number required and because they are in use but a small fraction of the time. Any kiln, whether up or down-draft, properly constructed, with due regard to the dimensions of flues and stacks, is a smoke consumer at one stage of the firing. When the ware is at its maximum temperature the products of unfinished combustion at the furnace undergo a second combustion, as it were, when coming in contact with the almost incandescent ware. It seems, therefore, that in the construction of kilns due regard should be paid to good combustion in the early stage of the burn, and to the size of the furnace, in order that no more heat can be generated than can be used; also to the size of the escapement ducts, in order that the gases of combustion should not be set free until the greatest amount of heat should be extracted therefrom. It is very obvious that the ideal conditions are attained when none of it is allowed to escape at a temperature above that of the outside air. Surely these conditions are most closely approached in the continuous kiln. It has seemed to date, however that the last proviso has not been complied with; that is, the production of the greatest percentage of first-class ware. As a sort of compromise has come the successful use of waste heat for drying; that is, the heat remaining in the ware after firing has ceased. This is surely a great step toward continuity in the process of manufacture, and, under favorable conditions in raw material, product required, etc., should be carefully investigated by the prospective builder.

In the planning of a plant it is always well to make a careful and adequate provision for a substantial increase in capacity. The power unit can be 35 or 40 per cent larger than necessary without any sacrifice in economy of operation, and the added interest upon the investment will be more than compensated in the lack of repairs owing to its easy work. The average brickyard insurance rate is too high and the permanent feature so important that the premium saved by using fireproof construction will usually pay a good return upon the investment, and the very best machinery, kilns and equipment generally are none too good, provided commensurate returns can be guaranteed.

The careful selection of machinery, driers and kilns best adapted to the material to be worked and needs of the available market; substantial settings and convenient placing, together with permanent buildings, make the modern brick plant one of the most marvelous of this later day's achievements, and it is, indeed, with great satisfaction the man who has planned it all wanders over the works in the waning twilight, after a good day's work is over, and says, "Well done, O good and faithful servant."

The Terre Haute (Ind.) Brick & Pipe Co. turned out more than 5,000,000 brick last year. The plant has been improved and its capicity increased, and next year's output will be considerably greater. At its annual meeting January 21st the company elected the following officers: A. Z. Foster, president; Charles Minshall, vice-president; W. R. McKeen, treasurer, and W. P. Blair, secretary.

The Argillo Works at Carbon Clic, Ill., which has manufactured firebrick exclusively, will add a special line of building brick to its output, including face, pressed and plastic brick. New sheds, 100 x 124 ft., have been erected and new machinery installed. S. J. Plant, the new superintendent of the Argillo Works, formerly resided at Toronto, Can., and has had a long and successful experience as a brick manufacturer.

The Caney Brick Co., of Caney, Kas., has just received samples of red and buff brick, dry pressed and stiff mud, from the American Machinery Co., Bucyrus, O., which is furnishing all the machinery for the plant. Tests had been made for the purpose of ascertaining the exact shrinkage of the shale so that the dies might be made of the right size. The samples were eminently satisfactory and the Caney products will be soon in the front rank of Kansan products.

Making a Terra Cotta Vase.*

The working drawings required for making the model of the vase are principally outline and plan, but when the vase is enriched with ornament, as is the one in our illustration, the drawing is made in two colors, the definite black line representing the "plaster block only," which may be termed the "background," in the present case, whilst the parts to be modelled in clay are lightly sketched in blue (see sketch A, in which the dotted line represents the blue line).

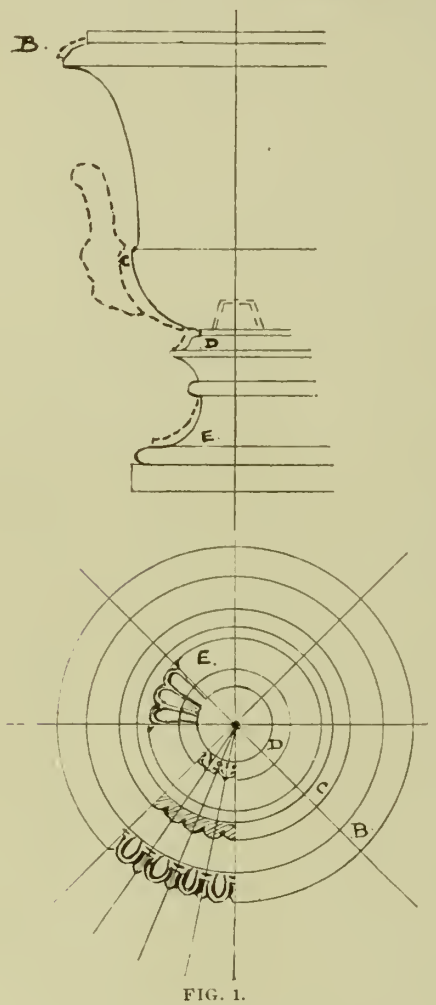


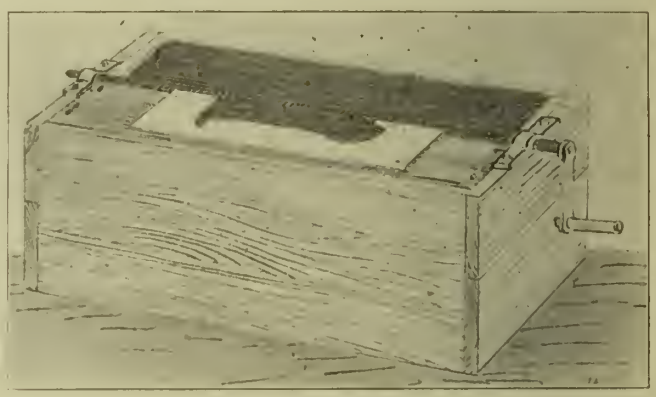
FIG. 1.

A plan is drawn for every portion of the vase where geometrical divisions are necessary. Our sketch shows part plans at B, C, D, and E, in Fig. 1. The modeller must adhere strictly to these divisions, even if he depart slightly in line from the blue line sketching of the draughtsman.

The model maker ignores, for the time being, the blue line, and cuts the "zinc reverse" to the black line as seen in Fig. 2, which shows the zinc nailed on to a wooden support, this board being cut out similar in outline to the zinc, but a quarter of an inch away from the edge so as to "clear" (as shown by the dotted line), for the wood must not come into actual contact with the plaster, of which material the block is to be formed.

The wooden support is made of sufficient length to suit the hand lathe. This is a box about three feet long and two feet broad, with a spindle and sockets, with adjustable caps. The spindle must taper slightly, so that the block when complete will slide off; it must also be square or rectangular in section, for, if round, the pressure of the zinc on the plaster, whilst turning, would cause the whole block to revolve on the shaft, instead of with it.

In fixing the wooden support on the hand lathe, care must be



THE HAND LATHE.

taken that the edge of the zinc reverse is exactly lineable with the center of the spindle—1.16 in. out of center means ⅛ in. in the block.

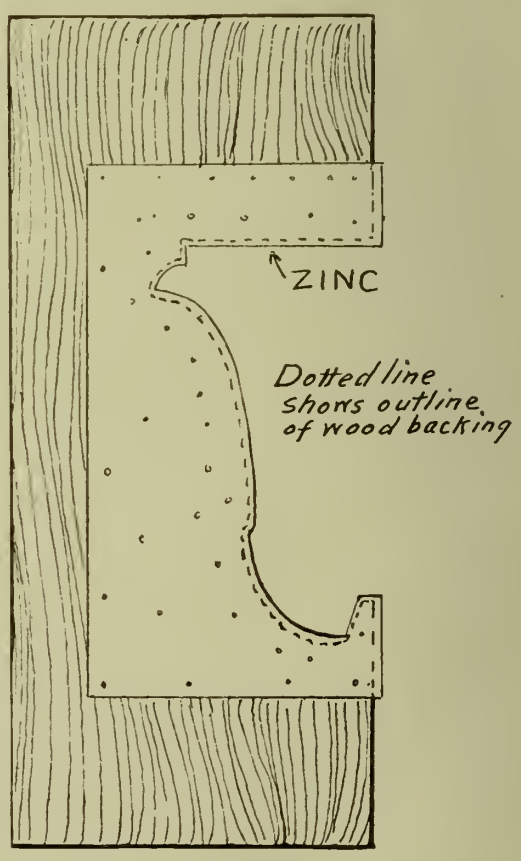


FIG. 2.

From a plaster slab two circular disks are cut with rough faces and edges. These are fastened on to the spindle with a little plaster and connected together with laths or narrow strips of plaster slabs. This forms a hollow core. This "core" is made as rough as possible,

*Drawings and data by the courtesy of the Brick and Pottery Trades Journal, England.

the strips being fixed about a quarter of an inch apart to form a good "key," the core being part of the model. (This is not the case with a core for straight molding, which is made smooth, so as to "leave.")

The workman now gages, or calculates how much liquid plaster it will require to make the block, for if he can complete with one gaging or mixing so much the better, if not, the swelling commences, and with this, vibration, and then follows difficulty in getting the block true.

The weak parts of the lathe, or the insecure fixing of the wood and zinc, show themselves at this stage. The socket caps being removed, and the spindle "up-ended," handle upwards, (which should

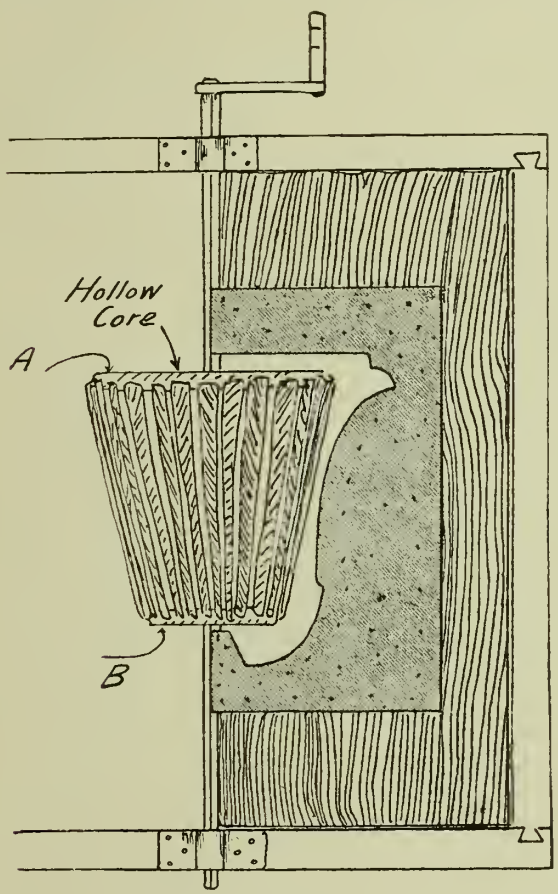


FIG. 3.

be the largest end), the block, with the help of some one to steady it, will slide down to the bench.

Another method, and one which is in much favor, is to make the block solid, first putting a mixture of plaster on the spindle and then hay or straw bands wrapped around while the plaster is soft, and then more soft plaster and rough waste lumps stuck on at random, until the shape is formed. The drawback to this method is the weight, for the basin of the vase, before the clay modelling is complete, has to be lifted and turned over continually.

In case of the foot, however, the solid process is the best, its size not permitting the use of a hollow core.

These plaster blocks, the "basin" and "foot," are now handed over to the clay modeller.

Referring to Fig. 1 it will be seen on plan B that the "egg and dart" beading repeats 32 times around the rim of the basin. No modeller could make 32 of these exactly alike, neither does he try, but models one only. This is molded and the 32 presses, or squeezes, are quickly made and are stuck on, in considerably less time than they could be modelled all around.

The same process applies to the enrichment on plans C, D, and E, but not to the ornament under the rim, the vine leaf and fruit not being suitable for repetition. Possibly one-third of the design would repeat, but the temporary mold required for the squeezes is too big and intricate to affect much, if any, saving. Owing to the delicacy of the stems in this design, the press would not come out in one piece and would require so much arranging on the vase, that a modeller

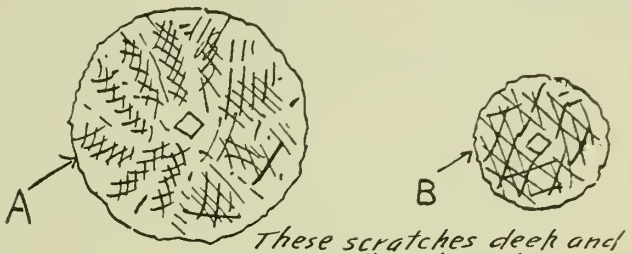


FIG. 4.

would prefer to model this part of the vase complete, an advantage thus obtained being the greater latitude allowed him in his lines.

It is unnecessary to model two handles, as these are molded separately from the vase, but the two faces being attached, are both required, and whether the modeller models one and duplicates it, or models the two, is immaterial, except that it is preferable that the

THE FINISHED VASE.

two faces should not be exactly alike in expression. Although the features are the same, one should smile and the other—not.

The handle is then cut off and laid aside for molding.

This claywork may take from one to three days, according to the richness and the quantity. Each portion as completed, is given a coat of shellac, which retards the action of the atmosphere and thus prevents the clay from drying and dropping off.

The three models—basin, foot and handles—are then ready for the mold maker.

Our illustrations show the "hand lathe," the plaster "slabs" or "washers" on which the hollow core is built; and this core in position on the spindle on the hand lathe.

(To be continued.)

OHIO VALLEY LETTER

FROM OUR SPECIAL CORRESPONDENT

Information is given out that conferences have been held in Clarksburg, W. Va., looking toward the establishing of a large plant there for the manufacture of sewer pipe. Several local citizens are agitating the matter and associated with them are certain Ohio sewer pipe manufacturers. The town of Clarksburg is situated on but one line of railroad—the Baltimore & Ohio—but the place is well located for fuel. In fact, it would be a difficult matter to pick out a section of country richer in that respect than the portion of West Virginia in which the town mentioned is located. Not only does the region abound with a 10-ft. vein of very excellent coal, but natural gas is also found there in large volume, and either may be procured at a very reasonable figure, the natural gas being supplied for manufacturing purposes for 5 cents per 1,000 cu. ft. While fuel at Clarksburg is evidently very cheap, there are other things required in order to successfully carry on the business of sewer pipe making, chief among which is the quality of the material to be used in producing the ware. While fuel and shipping advantages are very essential elements in a business of the character indicated, it occurs to me the primary matter for consideration in establishing a sewer pipe factory is that already intimated—quality of clay. I have some little knowledge of the Clarksburg bed of shale and while in one or two places good paving bricks are made from it, this is not necessarily conclusive evidence that similar favorable results will be obtained in an attempt to make pipe. It is, however, somewhat difficult to determine a matter of this kind without first subjecting the material to a proper test, which, as a matter of course, will be done in this instance before definite steps are taken with reference to installing a plant of any magnitude. Since the matter of fuel represents a very prominent item in sewer pipe making, should the Clarksburg shale prove suitable for that class of work, it is safe to assert no company could go far wrong in building a plant there.

The Knowles, Taylor & Anderson plant of the American Sewer Pipe Co., located at East Liverpool, O., is running full, as is also the Walker factory at Wellsville. The Lyth plant at Wellsville, is, however, still idle, with little prospects of an early resumption. Both the Walker and Lyth plants also belong to the American company.

The plant of the Dagus Brick Co., located near Ridgway, Pa., is being improved and additional machinery will be installed. The product of this plant has hitherto been dry-pressed bricks exclusively, but it is now the purpose to supplement this output by placing machinery for making stiff-mud bricks. An order has therefore been placed with E. M. Freese & Co. for a large union machine and automatic cutter and an order has also been placed with the Ohio Ceramic Engineering Co. for a Richardson repress and a quantity of double-deck steel cars. Of course, under the dry-press system no drier was employed, as the bricks were set in the kilns direct from the presses, (of which the company has two, one United States and one Simpson), but with the introduction of the other system, a drier will become essential. The company has not fully determined whether the steam or hot air method will be adopted, but it is understood a drier is to be constructed on lines formulated by the management of the plant. I am also informed that it is the purpose to ultimately abandon the dry-press method of brick-making at this plant. At present the company has a large stock of bricks on hand, with little inquiry for them, while many aplications are received almost daily for the other grade of bricks. The fire-clay found here is exceptionally good and when burned, assumes a very uniform buff color. The Dagus Brick Co. is composed largely of Pittsburg business men and a good portion of the output is disposed of in that city.

The factories of the East Palestine Pottery Co. and Ohio China Co. at East Palestine, O., are both running full time. The American Sewer Pipe Co.'s plant, located in that town, is also in full operation.

I am informed that a second brick plant may be installed at Elwood City, Pa., and that a contract has been entered into with the American Clay Working Machinery Co., of Bucyrus, O., to supply a portion of the equipment, such contract, as I understand, having been made upon condition that a satisfactory agreement is made with the owners of certain real estate the new company is endeavoring to lease. There seems, however, to be some difficulty about the matter and there is a possibility that a satisfactory adjustment may not be concluded. The piece of ground wanted consists of some ten acres and lies adjacent to the corporate limits of the town of Elwood City. On this property there appears to be quite a variety of brick material, including common clay, shale and a small vein of fire clay. The company has had a number of samples, both of bricks and hollow-building blocks, made from the material and the specimens are said to be very good. Should an amicable agreement be consummated with reference to the clay property, it is the purpose of the company to install a plant for the manufacture of bricks, hollow building blocks and fire-proofing and to manufacture these articles on an extensive scale. It is understood the conditional order awarded the American company includes an auger machine with a number of dies, one tile cutter and other small apparatus, and a steam drier to be complete with cars and transfers. It is also the purpose to install a 9-ft. iron frame dry-pan. H. W. Hartman, of Pittsburg, is understood to be the leading spirit in the new brick industry and associated with him are a number of Elwood City business men.

The plant of the Louisville (O.) Brick & Tile Co., is running full capacity. The product of this concern consists largely of hollow building blocks and the firm has acquired quite a reputation by reason of the very excellent quality of the goods manufactured and the extent of its capacity and sales.

The whiteware pottery at Leetonia, O., which has been lying idle some years, still has its doors and windows barricaded and from external appearances there is little hope of an early resumption of work at the plant. I am not very conversant with particulars concerning this establishment, but it seems passing strange that a pottery in these times of unusual activity in that particular line should be standing idle for so long a time. It has been intimated, however, that the prolonged activity is due to some internal dissatisfaction in the company.

The new town of Sebring, O., is stil maintaining its rapid growth, the two large potteries there continue in full operation.

This town was laid out some two or three years ago by the Sebrings, extensive pottery manufacturers of East Liverpool, O., and the venture has evidently proven a pronounced success in every particular. The two pottery firms located there are called respectively the Sebring Pottery Co. and the Oliver China Co. Speaking of this town of Sebring, recalls an incident which occurred recently while I was passing through there. Seated before me in the railway coach was a traveling man from the west who had evidently not passed over the route for some time. He expressed his surprise at seeing a town of such size having sprung up in a such a brief period of time and was heard to observe that it reminded him of certain Indiana "gas towns." While the growth of Sebring has certainly been rapid, it is to be hoped its decay will not be as speedy as some so-called "gas towns." In fact, there is no such doom awaiting this town of Sebring, judging from the magnitude of its manufacturing establishments, which were not enticed there by any "cheap fuel" boom.

Grafton, W. Va., will do some street paving this year. Vitrified brick will be used. A contract has been made with Daniel Burns, of Tarentum, Pa., to pave certain streets in the town at a cost of $14,000. This same work was advertised last year and a number of bids were received, among them being one from Mr. Burns, amounting to $13,000. The town council considered this figure excessive, and rejected all bids, losing as it happened, $1,000 of the citizens' money in the transaction. This advance in the cost of doing the work is attributed to the increase in wages and the difficulty to procure workmen. Paving material is apparently no higher than it was last year.

The C. W. Raymond Co., of Dayton, O., is supplying a good portion of the machinery for the pottery at Barberton, O., now being erected by the Barberton Pottery Co.

The town of New Martinsville, W. Va., will pave portions of at least 10 different streets this season and may shortly award contracts for the work. Vitrified bricks will be specified.

The town council of Cameron, W. Va., received bids for paving the main street, but owing to some dissatisfaction growing out of the character of some of the proposals received, the contract has not been awarded as yet, and it is possible the work may be readvertised.

It is stated the loss, by fire, at the Sherwood Bros. pottery, at New Brighton, Pa., will be upward of $10,000.

Various improvements are being made at the works of the Elwood Brick Co., at Elwood City, Pa., which, when completed, will possibly double the capacity of the plant. The present equipment of the works includes a slide-valve engine, one tubular boiler, one Phillips & McLaren 9-ft. iron frame dry-pan and a Henry Martin soft-mud brick machine. The output is possibly about 12,000 bricks per day, and these are dried on a floor, heated by means of fire flues, and are burned in open top kilns of which there are four in number. The dry-floor is to be dispensed with, however, and a contract has been awarded to A. F. Barron, of Chicago, for the erection of a 6-track "Iron Clad" steam drier. Mr. Barron will equip the drier complete, furnishing cars and other apparatus. The company is also installing a second tubular boiler, which is to be used for furnishing steam for the drier. An addition is also being built to the clay storage shed at this plant. The Elwood Brick Co. posseses a large area of brick material, this consisting of both clay and shale. The former is used principally in the dry season and the latter during the wet weather, this arrangement apparently being very satisfactory as it becomes possible under this method to maintain a full output at all seasons. This plant was operated throughout the entire winter, but is closed at present in order that the improvements mentioned may be made without interruption. It is thought three weeks will suffice in which to make the changes. The company finds ready market for its product at home, Elwood City, which is a prosperous manufacturing town of several thousand population.

The plant of the Hawthorne Pottery Co., of Maysville, Pa., is running full time. The product of this factory consists of jugs and crocks, made from fireclay, these being manufactured in a variety of styles and in light and dark colors.

R. M. Matson, Sons & Co., of Falls Creek, Pa., have secured an order for building bricks that will consume their entire manufactured stock, amounting to possibly 1,500,000 bricks, made during the past winter season. The capacity of this plant is 30,000 per day, the bricks being made by the stiff mud process from shale. The brick machinery used was supplied a year or two ago by the American Clay Working Machinery Co., of Bucyrus, O. The company has a considerable acreage of very fine shale material which lies close to the plant and is transported to the pans by means of small cars. The kilns used are the round, down-draft pattern.

It is given out that the Union Steel Co., of Pittsburg, will expend $20,000,000 in the erection of additional mills at Monessen, Pa., which means this concern will be in the market for large quantities of fire and building bricks. There are now a number of brick plants located within a few miles of Monessen, which will profit largely by the action of the steel company.

The Bonnot Co., of Canton, O., has installed an automatic cutter at the Globe Brick works, located near New Cumberland, W. Va.

The Meredith brick plant, situated near Camp Run, Pa., after being idle several months, has been again placed in operation, and is running full capacity. This plant was built about four years ago and its equipment includes a C. W. Raymond & Co. augur brick machine, pug mill and hand cutter, a 9-ft. iron frame pan and a George W. Sharer 4-tunnel hot air drier. The kiln department is composed of four round, down-draft. Part of the buildings occupied by this brick plant were used, in years gone by, for a saw mill, the owners formerly having been engaged in the lumber business on quite a large scale, and only retired from that industry because of the fact that the timber land owned by them has been cleaned off, with the exception of a few trees of an inferior quality. This case is one of a number of the same character, reference to which was made in a previous letter.

The National Fire-Proofing Co., of Pittsburg, has declared its regular quarterly dividend of 1¼ per cent. The stock of this concern suffered a slight slump in the markets during the past month. While the dividend declared by the National is not large compared with that paid by other clay companies, it must also be taken into consideration that the capital stock of the former is no small figure.

The plant of the Ridgway (Pa.) Brick Co. is running full time with many orders ahead. This company manufactures a variety of high-grade, face, building bricks on which quite a reputation has been established. The greater portion of the output is shipped to eastern markets. The material used consists of fire clay and red shale, and the bricks are burned in buff and red colors.

The Pittsburg Concrete Co., of Pittsburg, is being organized by a number of local building contractors and dealers, the purpose being to engage in the business of erecting concrete buildings. A Pennsylvania charter has been applied for with a capital stock of $10,000. The incorporators of the concern are James H. Pitcairn, Samuel Garrison, John W. Hallam, C. S. Kraur and A. S. Patterson.

S. S. B. Stevens, of Washington, D. C., a member of the United States Geological Survey corps, is making a tour of the clay-working industries of the Ohio valley. This gentleman

is gathering statistics concerning the variety and extent of clays used at each factory and the character of ware manufactured. This work is accomplished every year, and during his visit, Mr. Stevens will visit all potteries, sewer-pipe and brick works located in the territory named.

H. B. Nicholson, of Wellsville, O., has transferred his interest in the Wellsville China Co. to A. W. Weber. Mr. Nicholson was a large shareholder in the concern.

Changes have been made in the Ohio River Sewer Pipe Co., in which new stockholders will be admitted, but the management will virtually remain as hitherto. Notice has been published that a co-partnership heretofore existing between Chas. M. Stratton, Harper Stratton, W. B. Stratton and J. S. Casey, under the firm name as above, has been dissolved by mutual consent. The factory and office of this concern are located at Empire, Jefferson County, O., the company being but about two years old. Appropos of the dissolution of the co-partnership, a new company, bearing the same name, has been incorporated under the laws of the state of Ohio and the following officers elected: President, J. C. Bigger; vice-president and secretary, Chas. M. Stratton; treasurer, Harper Stratton; general manager, W. B. Stratton; superintendent, J. S. Casey. The first named is an attorney of Steubenville, O., and the other four persons are the parties who composed the original company.

A. F. Barron, of Chicago, has just completed the erection of an "Iron Clad" steam drier at the soft-mud brick works of Smith Bros., located at Wittmer Station, Pa. Mr. Barron states he is quite busy at present, having a number of contracts under way, located in different sections of the country.

It is stated the car situation is a little easier at present than it has been for some months, but there is still considerable room for improvement.

At a meeting of the stockholders of the American Porcelain Co., of New Brighton, Pa., it was decided to increase the capital stock from $50,000 to $100,000. It is understood the additional capital is to be used in enlarging the plant, which would also mean employment for many more men.

The Great Western plant of the American Sewer Pipe Co., located at Toronto, O., has been closed temporarily owing to the crowded condition of the yards, due to an overstock of manufactured ware. It is understood, however, the suspension will be brief.

Phillips & McLaren, of Pittsburg, are installing a second 9-ft. iron frame dry pan in the stiff-mud works of the Enterprise Brick Co., at Wilkinsburg, Pa.

Thos. R. Hammond, of Bolivar, Pa., a member of the Reese-Hammond Fire Brick Co., of that place, died May 10th, at Aiken, S. C. He was 49 years old and is survived by a wife and several children. Mr. Hammond was returning from a sojourn in Florida where he had gone for the benefit of his health and had stopped off at Aiken for a few days' rest when he was taken suddenly worse. Interment was made at Bolivar.

The C. W. Raymond Co., of Dayton, O., has sold an outfit to the Willetts Co., of Pittsburg. The order consists of a small dry-pan, pug mill and screen to be used in preparing clay for the manufacture of glass-house pots. In this connection I might say that I am informed the Raymond company is paying considerable attention to the manufacture of machinery for potteries and glass-houses and that a number of very good contracts have been secured in that class of work.

Thomas Sankey, a member of the firm of Sankey Bros., extensive brick manufacturers of Pittsburg, has died at his home on the south side. The deceased was 59 years of age and leaves a wife and several children.

Information is given out that T. C. Jenkins, engaged in the wholesale grocery business at Pittsburg, will erect a 20-story building in that city, and there will also be other high buildings put up this season, which means demand for large quantities of brick and fire-proofing.

S. B. Goucher, of the American Sewer Pipe Co., of Pittsburg, has placed in navigation a ferry boat on the Ohio River between Wellsville, O., and Congo, W. Va. The vessel is said to be very fine and to outclass any craft of its character between Pittsburg and Cincinnati. Mr. Goucher, in addition to being an extensive and successful sewer pipe manufacturer, which business he has followed for many years, also appears to have a decided liking for water crafts, as the boat above referred to is not the only one he is interested in. Mr. Goucher is also a part owner of the Toronto (O) ferry boat.

Members of the Monogahela Clay Manufacturing Co., of Pittsburg, a concern installing a large brick plant at Monongahela City, Pa., are considering the advisability of building another plant, the latter to be used in the manufacture of fire proof glass. It is said there is but one plant in the United States making that commodity and this is located on the Pacific coast. It seems no definite action has been taken as yet with reference to building the new plant, but the project is receiving very serious consideration.

Quite a number of engines have been placed in brick plants in the vicinity of Pittsburg by the Houston, Stanwood & Gamble Co., of Cincinnati, and from what I can learn they are giving excellent satisfaction in every instance. The engines built by this firm are of the tangye-bed pattern, short-stroke, slide-valve, and they are built very heavy and appear to be particularly adapted for use in brick plants, where the work required of such machinery is both severe and very irregular.

Work on the pottery to be built at Salineville, O., has not been started as yet, but the delay is attributed to the fact that the railroad company has not completed the siding into the site where the new plant is to be located. When this is done, it is understood shipment of the necessary material for the buildings will be made and construction work will be commenced.

What is known as the Pool bill has passed the Ohio state legislature and is now a law. The passage of this bill creates a change in the manner of determining elections held for the purpose of issuing bonds for sewer purposes. Hitherto a two-thirds vote has been required to determine such questions, but under the late law a majority vote will suffice.

A "Champion" rock-crusher has been installed in the Forest City works of the American Sewer Pipe Co., of Pittsburg.

A strenuous effort is being made by the Wabash R. R. to secure rights-of-way for a branch line from Steubenville to Toronto, Ont., thence up to the river, but thus far little success has been attained. The new road would run parallel with and very close to the line of the Cleveland & Pittsburg R. R., and as might be expected the latter is doing all in its power to block the progress of the would-be competitor. It goes without saying that another railroad along the route outlined, which is a veritable bee hive for manufacturing establishments, would be an excellent thing for the sewer pipe and brick manufacturers who are exerting every influence to this end. While the manufacturers themselves as a matter of course would be perfectly willing to donate a right of way through their respective properties for the new road, as much can hardly be expected of property-holders who are not as largely interested in the outcome, especially in instances where the granting of such right-of-way would prove a direct injury and loss to the property affected. I am informed that the manufacturers who are agitating this matter are insisting that the small land owners should take the same view of the situation as themselves, but that the smaller property holders on the other hand are just as insistent that they should be properly remunerated for any transfer they might make. In view of this

situation, the matter of constructing the much-needed competitive line of railroad is still far from being realized.

Another effort is being made to form a combination in the pottery industry and the promoters of the deal this time are Chicago men. As I understand it, the plan is to leave out eastern manufacturers and form a company of all potters west of the Allegheny mountains. The purpose is to pay one-third cash for all properties acquired and issue bonds for the remaining two-thirds, excepting the amount to be paid the promoters for their services. The value of the several plants to be procured is to be determined by the profits of each.

Two additional down draft kilns are being built at the Ohio Valley sewer pipe works, at Toronto, Ohio. An office building has also just been completed there.

The immense building for the East Ohio Sewer Pipe Co., at Irondale, Ohio., has been completed and the work of installing machinery is well under way. The building is 300 by 150 ft., four stories high. The floor space is estimated at 135,000 sq. ft.

A number of the leading fire brick manufacturers have consolidated under the style of the American Refractories Co. with an authorized capital stock of $22,500,000. A charter has been applied for in the state of New Jersey, T. L. Chadbourne, jr., of New York, being the promoter of the mammoth organization. The fire brick concerns absorbed by the new company are as follows: The Harbison-Walker Co., Isaac Reese & Sons, Phillipsburg Fire Brick Co., Clearfield Fire Brick Co., Wallaceton Fire Brick Co., Clinton County Fire Brick Co., Fredericks, Munro & Co., the Layton works of the Fayette Manufacturing Co., and the American Fire Brick Co. The board of directors, which will consist of 15 members, has not been chosen as yet. The firms mentioned compose a majority of the larger fire brick makers of Western Pennsylvania, but there are still quite a number on the outside. The principal offices of the new company will be located in Pittsburg. In this connection I might add that an arrangement has been in vogue for some years among a number of fire brick manufacturers whose plants are located in Western Pennsylvania, but who are not included in the above list of firms recently absorbed by the American Refractories Co., whereby the selling price of their product has been regulated. Under the provisions of an agreement entered into, officers are elected annually and regular monthly meetings are held in Pittsburg, which meetings, as a rule, are attended by a good-sized representation of the concerns interested. By this arrangement (which is really nothing more than a selling-price agreement, each manufacturer being privileged to conduct the affairs of his plant to suit himself) it is not only possible to regulate prices, but it is also a means of bringing the manufacturers together at stated intervals for an interchange of views on the subject of fire brick making. While the formation of the new gigantic corporation will doubtless be an excellent thing for those interested, as it will serve to stimulate prices and at the same time have a tendency to reduce running expenses, since all business will be transacted through one office, it will also, quite probably, be the means of other brick plants being built, if past experience in such matters may be considered as a criterion. The time was when it was thought good fireclay could only be found in a very limited number of places, but that notion is rapidly disappearing, as excellent firebricks are now being produced, in large numbers, in many sections of the country where the material used in their manufacture is a comparatively recent discovery.

An additional down draft kiln is being built at the New Castle brick works of the Marquis Limestone & Clay Co.

A tunnel drier is soon to be erected at the fire-brick works of S. Barnes & Co., located near Rochester, Pa.

The Kittanning Brick & Fire Clay Co., of Pittsburg, has been awarded the contract to supply the face bricks for the new Wooster (O.) college buildings, which are soon to be erected to take the place of those recently destroyed by fire. In view of the extraordinary competition, the securing of this large order by the Kittanning firm may be considered quite complimentary. The bricks selected are made from fire-clay and the color is buff.

At the beginning of the year 1901, J. A. A. Brown, superintendent of the Pittsburg bureau of building inspection, ventured the prediction that the building permits for the coming year would aggregate $20,000,000. While this prediction was not fully realized, Captain Brown only missed the mark by about $500,000, as the permits issued during the period named amounted to upwards of $19,500,000, which figure surpasses all prior records, and according to the annual report of the bureau, lately issued, the amount of money involved in building operations for 1901, was double that of 1900. The number of permits issued was 4,495, 75 per cent of these being for new buildings. It is estimated that if all the buildings erected during that year were placed side by side, a solid frontage, 12 miles long, would be the enormous result.

The Douglas-Whisler Co., of Vanport, Pa., which firm recently disposed of its large fire-brick plant located at that place, to the Speer Clay Manufacturing Co., of Pittsburg, has decided to build another plant, which is to be much larger than the one lately disposed of. The new plant is to be located on the north side of the Beaver river, opposite the city of Beaver Falls, Pa., and a railroad siding has been already laid on the property. The work of excavating for buildings and kilns is also under way. It is the purpose to put up a plant that will be large in every department and arranged with all modern conveniences. The plant will be equipped with up-to-date machinery for the manufacture of fire, building and paving bricks. It is expected that several months will elapse before the new works will be ready for operation, notwithstanding the fact that no time will be lost in pushing forward the construction work.

Pottery Interests in New Jersey.

The bulletin issued by the United States Census shows that in 1900 New Jersey had 81 establishments engaged in the manufacture of pottery, terra cotta and fire-clay products, with 8,117 wage earners, and products valued at $8,940,723. In 1890 there were 60 establishments, 4,425 wage earners, and products valued at $5,165,537, showing an increase in value of products during the decade of 73 per cent. Much of the product was brick and fire-clay goods. The bulletin, in commenting on the manufacture of pottery, says:

The city of Trenton is the most famous pottery center of New Jersey, its name being as naturally associated with the industry in the United States as are the names of Staffordshire, Dresden and Sevres with the industry in Europe. Some of the finest qualities of porcelain and granite are produced in this city, and in the production of sanitary ware Trenton leads all other centers.

The first pottery works in New Jersey were erected at Old Bridge, Middlesex County, but the first white ware with any pretensions to artistic beauty was made by the American Pottery Co. at Jersey City in 1829. In 1852 the pottery industry of Trenton was begun by James Taylor, in partnership with a man named Speeler. Mr. Taylor had been previously engaged in this manufacture at Jersey City. Yellow and Rockingham ware were successfully made and some experiments tried with porcelain. In 1856 the firm made white granite ware in connection with its other products, and the same year received the Franklin medal in recognition of what had been accomplished. In 1857 the Excelsior Pottery Co. was organized and erected large works along the banks of the Delaware and Raritan Canal. Many who sub-

sequently became successful pottery owners or managers received their training in these works.

The first pottery for the production of white granite and cream-colored ware was established in 1859 by the firm of Rhodes & Yates, and other master potters soon followed their example.

The Centennial Exhibition in 1876 opened a new era in the pottery industry. The ivory porcelain and Parian vases exhibited there by Trenton manufacturers attracted much attention and greatly lessened the popular prejudice in favor of foreign-made pottery. The stimulus thus given called into existence many new establishments, some of which afterwards became famous in the industry.

New York Notes.

A "Brick" representative was shown through the immense plant of the New York Brick & Paving Co. a few days ago by the superintendent, W. M. Dutcher. This plant was built 12 years ago and is in excellent condition,and is worth in the neighborhood of half a million dollars, as it now stands. It was built by a stock company of Syracuse capitalists, who have realized good returns upon their investment. The construction was under the supervision of Mr. Dutcher. When he came to the city the ground upon which the plant was to be built was covered with salt covers, the remains of the once largest industry of Syracuse. The New York Brick & Paving Co. get clay from a place on the Oswego river, about 13 miles distant, shipping two boatloads a day as long as the canal is running. One boatload is placed in the machines and is immediately made into brick and the other is stored in the yards, for use in the winter, when the canal is not navigable. Were it not for the canal the company could not be so far away from its clay supply, but the rates on the canal are so low that this can be done with profit. The coal is also obtained by canal, two boatloads being used every week.

The output of the plant is about 60,000 per day the year around. Clay is boated seven months in the year. The company has no trouble in disposing of all the brick that it can make, the demand being very large for several years past.

The plant is equipped with two 12-tunnel Sharer dryers, the wooden tunnels to dry the brick being 32 ft. long. The engine which runs the plant is a C. & G. Cooper corliss. There are five Eudaly kilns with 14 furnaces in each kiln. Each kiln has 10 or 12 burns a year, and it takes from nine to twelve days to properly vitrify the stock. Besides these kilns there are 12 round kilns of later construction.

Mr. Dutcher believes that it pays to keep up repairs, and although this item of expense may be very large, the results will more than make up. The waste brick is run through a crusher and is used for macadamizing purposes. The company receives lots of orders for brick of special shape for different purposes. It has some which are 7½ square by 2 inches thick, to be used for lining acid tanks and for sulphite digesters, and also some smaller brick for stable floors in New York City. Interlocking tile is also made.

The plant is located in the west end of the city and covers about twelve acres. The company keeps its own horses and wagons and has a blacksmith and carpenter shop on the premises. The company has recently built a stack 105 ft. high, all of vitrified brick, laid in portland cement. The company ships everywhere it can by canal, as the plant is located on the canal banks. In the neighborhood of 200 men are employed at the plant the year around. Last winter there was a shut down on account of difficulty in obtaining coal.

George W. Pack & Son have commenced to burn a kiln of 200,000 brick and are making more right along. They are getting them out on racks and pallets. The demand, they say, is large.

The contract for the new vitrified pipe sewer at Amsterdam was let to the Eveline Contracting Co., of Waterford, N. Y. It will require 20 cars to ship the order.

The city of Syracuse will build about $33,000 worth of new sewer during the present season. Advertisements will be made from time to time by the board of contract and supply.

The Kirkville Brick Co., after an idleness of one year, is preparing to make pressed brick. The company is repairing the plant at Kirkville and will have a large capacity for turning out brick. The work is being done under the supervision of Henry Hasbrouck, who is superintendent of the plant.

The Syracuse Stoneware Co. says that its fire brick business was never as large at at the present time. The demand is so great that customers are complaining because they do not get their orders sooner. The Akron factory is simply overwhelmed with orders and is doing everything possible to make the shipments on time.

The Eastern Paving Brick Co., of Catskill, N. Y., has been placed in charge of Howard P. Eels, receiver. The application for a receiver was made by a Cleveland concern, which alleged default on the interest upon $180,000 of bonds.

The severe frosts last month did great damage to brick yards in the northern part of the state. In Watertown several thousand brick belonging to the Watertown Brick Co. were destroyed. They had been molded, but not baked, and were frozen stiff.

The Onondaga Pottery Co. is turning out large orders every day. One of the largest was for several thousand pieces for the new commons at Yale University. Upon every piece is the Yale seal. The company has a new system of underglaze printing which is bound to prove useful and popular.

The Osborne Engineering Co., of Cleveland, O., has been engaged to prepare plans for and to erect the new plant of the Empire Portland Cement Co. at Warners. A series of fire proof buildings will be erected, to cost $60,000. The plant will have a capacity of 750 barrels a day, which can be increased to 1,000 without making any pronounced changes.

The proprietors of the brick and tile factory at Watseka, Ill., are building a new kiln, the second to be erected this year.

The Attica Brick & Tile Co., of Kingsman, Ind., resumed operations May 1st, under the management of James Sowers, Jr.

A plant with an annual capacity of 3,000,000 is to be erected at Stanton, Neb. Local capitalists have subscribed $12,500 and it is proposed to install a complete and modern plant.

The Michigan Brick Co. is turning out 30,000 brick per day at its plant at Vriesland, the product comprising both white and common building brick. H. H. O. Langereis, of Grand Rapids, is secretary and manager of the company.

The work of rebuilding the plant of the Reese-Hammond Firebrick Co., at Bolivar, Pa., which was recently destroyed by fire, is rapidly progressing, the contract having been awarded to E. M. Lockard, of Indiana, Pa. The new plant will be thoroughly modern and fireproof.

The Brown County Brickmakers' Association recently held its annual meeting at Green Bay, Wis., and elected the following officers: H. W. Powers, president; Charles M. Steno, secretary, and H. W. Powers, John Roffers and Felix Poels, members of the executive committee. Present indications point to an unusually busy season for brickmakers of Wisconsin, and it is probable that the Green Bay yards will run at their full capacity throughout the summer.

Clay Matters, Etc., in the District of Columbia.

Spring is here with its *dolce far niente* spirit so closely related to that "tired feeling," which is somewhat characteristic of the climate of the District of Columbia. But in spite of the fact that people "take things easier" in Washington than in most places—met by appropriation—a great deal of energy is now being put forth and business is on the jump.

The brickmakers and builders are the busiest here now, and the real estate man is thriving wonderfully. In the matter of brickmaking things are humming; every factory is busy, prices are good, (same as last year), and there is demand for all the output. And this season the brick output will possibly exceed that of last year—which is saying much.

FACTORY OF POTOMAC TERRA COTTA CO.

The rapid manner in which Washington—not being to any marked extent a manufacturing city—is increasing its structural, I may say "brick wealth," is really surprising. Every year from five to six millions of dollars are put in new buildings here, and this work is on the increase as time goes on. A report of building operations in the District of Columbia for the month of April gives the following permits issued: Nine apartment houses, value $307,500; one church, $48,000; one college, $90,000; sixty brick dwellings, $25,340; thirteen frame dwellings, $29,285. Total unmber of permits issued, 313, representing $1,015,000. This is a fine showing for one month, and speaks well for the business prospects of the District brickmaker.

Many of the building enterprises now underway are on a large scale. The apartment house still is the big feature in structures, and, as is seen in the above statement concerning permits, a means of large investment. The new school buildings are giving much help to the brickmaker. Some of these (the buildings, not the brickmakers) are very large and will cost from $22,000 to about $115,000 each. There is much liberality concerning schools in the District, and the child is fortunate who has a residence here.

In the matter of government work the brickmaker has a great deal to look forward to. And if all, or nearly all, of the buildings proposed are put up within the next few years the demand for material will be large.

Of course brickmakers outside of the District of Columbia will have opportunity to offer their product to Uncle Sam, the difference in competition being the long haul of freight.

One of the government buildings projects is a municipal hospital to be erected at the head of Thirteenth street. The plan comprises a group of buildings located upon about thirty acres of ground. The hospital when finished will be one of the finest in the world; the cost will be about $3,000,000.

The new Agricultural Department building will cost between two and three millions of dollars, and the new State Department, Department of Justice, and offices for the president will no doubt be generously looked after by Congress. Other buildings looked for are those for a war college, to be located in the Arsenal grounds—at the southern part of the city and by the river—a new armory for the D. C. National guard—which will also be used as a place for inaugural balls—a municipal building, and improvements at the Government Insane Asylum. Now, in view of all this work, in future the brickmaker can surely say "There's millions in it."

As to the height of buildings in the District of Columbia and their fireproof qualities, it is desired to make a discrimination in favor of churches. Does this suggest the idea that all churches are less liable to burn than are "worldly" structures? Also, are the members more fireproof? Anyhow, they should have less fear of fire.

But with other buildings there will be a difference—if the ideas of the D. C. commissioners about this matter are adopted by Congress.

The revised high-building bill as recommended is, in part, as follows:

"Sec. 1. That * * * no combustible or non-fireproof building intended to be used or occupied as a residence or as an apartment house or hotel in the District of Columbia, shall be erected to a height of more than five stories or raised to a height exceeding sixty feet above the sidewalk.

Sec. 2. That buildings intended solely for building purposes may be erected to a height of seventy-five feet without being fireproof.

Sec. 3. That all buildings, excepting churches, hereafter erected or altered to exceed seventy-five feet in height shall be fireproof. * * * Within fire limits churches hereafter constructed, including Sunday-schools and meeting rooms, must be of fireproof construction up to and including the main or auditorium floor.

(Now, what's going to become of the gallery and choir loft? Is somebody trying to "get even" with the church choir? I, for one, don't believe the church choir is fireproof—the average choir. It's a good place for courting and snickering and—sometimes—music.)

WHERE THE COMPANY MAKES ITS PILE.

Sec. 4. That no building shall be erected or altered to exceed in height the width of the street in its front. On business streets and avenues * * * no building shall be more than 110 feet in

height, except on business streets or avenues 160 feet wide, where a height not exceeding 130 feet may be allowed. On residence streets and avenues no buildings shall be erected to be over 80 feet high, nor shall it exceed ten feet less than the width of the street upon which it abuts, except on streets sixty to sixty-five feet wide, where height of sixty feet will be allowed, and on streets sixty feet wide and less, where a height equal to the full width of the street will be allowed."

So, you see, Washington is to be made a model city. No sky-scrapers and no squatty houses for the capital. "Just so and no soer." That's what.

But the tall building helps the brickmaker—makes a greater *rise* in bricks.

Recently I visited the works of the Potomac Terra Cotta Co. and saw the process of converting clay into conduits for electric wire. The factory—situated about four miles from Washington and in the District of Columbia—is quite large—and now, very busy. It has work enough (making conduits) to last all summer. The capacity is for about 1,500 conduits, larger size, per day. Sewer pipe, of which a great deal is sold to the District, is also made there, but at present the business is principally in conduits. These are seen at the factory in all stages of the making process, from the wet clay to the finished article, stacked in huge piles, waiting for shipment.

There is an abundance of fine clay near this place and it is easily gotten at. A short haul takes it to the grinding mill, where it is thoroughly broken up, and then driven by spiral pressure through a horizontal cylinder; from the mouth of this it falls into receptacles on a belt conveyor and is taken up to the grinding mill and then to the crushing rollers for further treatment. After being crushed fine the clay is conveyed by belt-conveyor to wetting-down floor, where it is wetted and left in piles for about five days, after which it is pugged and made ready for the forcing presses. From the press the clay comes in the shape of two-way and four-way conduits, according to the die employed.

When conduits are being made the prepared clay is turned into the die-cylinder by an attendant—on the top floor of the building—who pulls a lever when material is wanted. In making the largest (4-way) conduits, one pull of the lever empties sufficient clay into the cylinder to make one conduit.

The attendant mentioned performs a triple service—rings a bell to notify the off-bearers at bottom of cylinder that a conduit is ready to be driven downward from the machine; pulls the lever that lets out the necessary amount of clay, and pulls a whistle cord, to hurry up the workers on the first floor who are starting the material upward. The man in the "attic" is a busy individual.

The Potomac Terra Cotta Co. shifted its stock—changed owners—April 1st., the amount paid being about $100,000. But there was no change made in company's officials. These are: President, Harry B. Mason; vice-president, G. Earnest Mason; secretary and treasurer, G. G. St. Lee. This company was the first in this country to make electric conduits. It furnishes material for many places in the United States; also exports to Cuba. One of its big orders was for conduits for the Havana Electric Railway. A large order is now being filled for the Long Island Railway Co.

In the matter of electric conduits for the District of Columbia, the Potomac company has a monopoly. The patent for these conduits is owned by this company, but there are two or three other companies using it—of course, by arrangement by which the Potomac company is recipient of the *quid pro quo*.

Not a great deal of conduit work is now being done in the District of Columbia, but street improvement calls for considerable sewer pipe. The amount of this used last year was about 72,000 feet, in size from 6-in. to 24-in. Cost was about $19,765.

Ernest Bentler has just started his new brick plant at St. Cloud, Minn.

New Process.

W. H. Miller, No. 39 Canfield-East, Detroit, Mich., is contemplating engaging in the making of brick from Portland cement and sand.

Arnold-Creager Co.

Announcement is made of the union of the interests of the Jonathan Creager's Sons Co., of Cincinnati, O., with those of D. J. C. Arnold of New London, O., under the corporate name, The Arnold-Creager Co. The new company has factories and executive offices at New London, Huron county, O., with offices also at Cincinnati, as formerly, where orders and correspondence may be directed as usual. The united efforts of the old concerns will be for the production of the most complete and desirable line of brick machinery and supplies ever offered the trade, and the combined facilities will enable the company to promptly execute the largest orders; at the same time smaller ones will be thankfully received and faithfully attended to as heretofore.

Laclede Fire Brick Manufacturing Co.

The Laclede Fire Brick Manufacturing Co., 914-915 Wainwright Bldg., St. Louis, Mo., has issued a handsome catalog describing its products which are illustrated most effectively by a series of admirable half tones. For half a century the company has had a steady growth, and it is now in the front ranks of clay manufacturing concerns, with an apparently unlimited capacity for the supply of the special lines of goods which it carries. The works contain numerous acres of drying floor and storage shed and the shipping facilities of the plant are unsurpassed. It is especially in the arts of making retorts and tiles that the company excels, and since its installation in 1844 it has acquired every invention of merit in this direction, so that the products are of premier excellence and serviceability. The Laclede retorts are used all over the country. They are carefully made by hand, the clay being tamped down round the core in an outer casing. This casing is raised as the work progresses, and when the full length has been attained the core is withdrawn, leaving the interior smooth and perfect.

The company also makes a specialty of the inclined retort system of coal gas manufacture. The system was first brought to the United States by James Green, president of the company. The illustrations cover every variety of coal gas bench now in use and the catalog concludes with an illustration of the famous Laclede fire brick of every kind.

A. K. Eastes, of Buena Vista, has commenced the brick business at that place and has good prospects for the coming season in view of the growing building trade in that part of the country.

Shepfer & Moomaw Bros., Sugar Creek, O., have acquired clay land for the purpose of manufacturing brick and will soon be installing machinery and kilns for immediate operation. The business prospects of the District are good.

The Hastings Brick Works and the Hastings Brick Co. are two distinct concerns, though Klose & Polenske, of Hastings, Neb., are the proprietors of both. The two plants have been operated for the past ten years with an annual output of 10,000,000 brick, and the prospects for this season are excellent. Building, paving and sidewalk brick are made and a ready market is found for all that can be made. Most of the product is shipped, there being four railroads available. The company has just installed a large size Potts clay crusher.

SEGER'S COLLECTED WORKS

Translated from the German Expressly for Brick

Pottery Kilns with Gas Firing and Continuous Operation.

Under the above title an article appeared in the "Deutsche Bauzeitung," 1872, No. 16, written by Herr Mendheim, the engineer who constructed the new gas kiln in the Royal Porcelain Manufactory at Charlottenburg.

The writer of the article makes some comparisons between this gas kiln and the annular kiln with which I cannot altogether agree, and I therefore desire to continue the discussion, hoping to serve the interests of the pottery industry by bringing about a clear understanding of the subject.

It is beyond all dispute that the Hoffmann annular kiln, which has within a few years produced an epoch-making revolution in the pottery industry, especially in the manufacture of bricks, should be counted among the most important inventions of later times, from the standpoint of national economy, and it is equally undisputed that the inventor of the kiln has gained a reputation extending far beyond the boundaries of his native land. In evidence of this we may point to the extensive introduction of the kiln into all branches of the pottery industry, about 800 being used at present, and to the fact that all the kilns used for pottery which have made their appearance in recent times and which aim at economy of fuel, are based more or less closely upon the fundamental plan of the Hoffmann kiln, that is, the continual advance of the fire in a closed ring, the greatest possible cooling of the escaping furnace gases and the utilization of the heat latent in the burned wares for the heating of the atmosphere in the kiln. There are, however, variations in the kind of fuel and in the design of the kiln chambers, according to the nature of the wares to be burned or the especial end to be accomplished. At first sight one would place this new annular gas kiln in the latter category.

The annular kiln has shared the fate of all great inventions. At first it was declared impractical and impossible by technical experts and non-technical workers. When, after unremitting study and great sacrifices, the inventor proved that in spite of the technical objections raised the kiln, when properly managed, would produce the best results, there arose immediately enthusiastic admirers on the one hand and on the other ignorant and envious men who made contemptible attacks upon him and endeavored, by taking advantage of a curious misunderstanding of the dispute on the part of the Prussian Patent Commission, not only to deprive him of the honor of the invention, but also to denounce him before the world as a most detestable plagiarist.

I do not class Herr Mendheim among these adversaries of the annular kiln. Herr Mendheim's investigations in connection with the erection of the new plant of the Royal Porcelain Factory are of unquestioned value for the pottery industry, and his views cannot be overlooked, as they have great weight with manufacturers in this branch.

In the beginning of his article Herr Mendheim acknowledges the great advantages presented by the Hoffmann annular kiln in the manufacture of ordinary bricks, but declares that it cannot be used at all in the manufacture of finer products, such as high-grade pottery, facing bricks, even the better kinds of building bricks and clinkers, and he recommends that for the manufacture of such wares there be substituted for it *mutatis mutandis*, an annular kiln with gas firing on the principle of the Porcelain Manufactory at Charlottenburg.

Facts speak louder than theories, and in order to refute Herr Mendheim's statements I would only need to give here a long list of plants in which good building bricks and facing bricks are made in annular kilns. But I should like to go still farther and call his attention to the fact that even the world-renowned Oldenburg clinkers* are made in about half a dozen kilns, that the stoneware factories in Ziesar, Belgern, Gorke, Oberglauche and Krummnussbaum employ this system for glazed wares, that English factories secure with it a salt glaze on products from refractory clay, and that in one of the most important stoneware and faience factories in Lorraine an annular kiln is in the process of construction, in which the wares will be burned in saggars, since good results were obtained from experiments in another kiln. These facts to prove that after great economy in fuel has been secured it does not always seem necessary to relinquish it out of apprehension for the excellence of the products.

Of course all these factories have had to contend with great difficulties at the outset. That is to be expected in any plant. The same difficulties arose when the annular gas kiln was transferred from the manufacture of porcelain to that of bricks and they exist today in a great number of brickyards which cannot produce a single respectable backing brick. But if the manufacturer of finer wares, having acquired an understanding of the peculiarities of the kiln, has succeeded in overcoming the difficulties and in combining economy and excellence of product, it is reasonable to expect that when intelligence, which has heretofore been conspicuously lacking in workers in the ceramic industry, has once gained a foothold there, others with inferior wares will secure the same results. At any rate, just at this time, when the industry is beginning to revive, it does not seem justifiable to pass such a severe sentence as Herr Mendheim does.

The objection made in many quarters to the annular kiln, and the one especially emphasized by Herr Mendheim, is that it is said to be impossible to burn in the annular kiln products which ought to present a surface of uniform color, and that for this reason the advantages afforded by the system of continuous burning with direct firing must in many cases be relinquished in order to avoid the production of inferior wares.

In the case of glazed wares when fuel producing many ashes is used, this may be true, but it is by no means so conspicuous a drawback as Herr Mendheim imagines, for a prudent manufacturer will not use peat for the open burning of glazed ware in a kiln of any construction whatever, but a pure stone coal or wood. The objection is valid only in the frequently recurring case that the unreasonable demand is made of the annular kiln that it produce the finest products with the worst fuel that can be found. I think Herr Mendheim would be embarrassed even

*F. Reisebriefe von Dr. H. Seger, Notizblatt, 1872, p. 101.

with the gas kiln, in the face of such demands, though perhaps not so much so as with the annular kiln.

All surface impurities in bricks which have been burned in an annular kiln are very unjustly attributed to the ashes, and although this may be true in the case of objects which come in direct contact with the fuel, it is certainly not the cause of all the discolorations, the latter being due for the most part to other sources. It is not difficult to demonstrate that the greater part of the discolorations of unglazed products are occasioned by the nature of the furnace-gases and the manner in which the heat produced is utilized to the utmost, and that the same phenomena must appear in the annular gas-kiln also, unless the same precautions are taken to prevent them as in the ordinary annular kiln. The neglect of these precautions will be avenged in a manner which Herr Mendheim considers to be some fault of the kiln.

When the fuel is converted into gas there is no longer the presence of ashes in the kiln chamber to contend with, but other much more serious drawbacks are not overcome; the chemical action of the flame is not altered, neither are the gaseous impurities of the combustion gases, which appear in all furnaces, removed, as these cannot, from very evident practical reasons, be purified.

Anyone who will take the trouble to examine the surfaces of bricks with magnifying-glass and microscope will be able to discern easily which impurities are caused by ashes and which are due to other causes. It will be seen that all deposits of ashes except those adhering directly to a clinker which has been brought to a vitreous fusion, which therefore, have in this case lost their form by fusion, can be easily recognized by their cellular structure, or, if the fuel used was stone coal, by the slaty, splintery or melted character, and can be removed more or less readily by rubbing or washing.

The observer will notice further that coatings which cannot be removed are most likely to appear on objects with a smooth dense surface, which is unfavorable to the adherence of ashes. This is especially true of machine made bricks and of the ordinary and facing bricks moulded with water. It will be noticed also that they rarely or never appear on bricks moulded in sand with a rough surface. I beg Herr Mendheim to notice that marked deposits are frequently found upon the smooth surfaces of machine-made bricks, while they are entirely lacking or are much less marked on surfaces roughened by the wise cutter.

Even if these phenomena force one to further study, this much at least is certain, that they are not caused by ashes in the great majority of cases. Even the bricks from Flanders and the Lower Rhine, so inferior in form and durability, which are burned in meilers in direct contact with the fuel, do not exhibit such streaked discolorations, even when clinkers are accidentally formed, as are frequently found where more perfect firing-apparatus is in use.

This goes to show what an unimportant part is played by the ashes in the surface coloring of unglazed products. On the other hand there is evidence in kilns of any construction, in which discolored or cleanly burned bricks are standing, that the surfaces of the bricks may be covered with the finest flue dust without injury to their color.

Now even if it does seem bold to compare an apparatus which has demonstrated by a number of instances the possibility of securing good results with one which, so far as I know, has been constructed and operated in only one instance, there is all the more reason why we should wait for further evidence from the latter, since it has been used up to this time only in the production of the highest temperature attainable in technical science. However a well founded doubt may be allowed, as to whether the comparatively low temperatures in other branches of the clay industry may be extended with the same safety to the entire chamber of the kiln. It may well be questioned whether the same drawbacks of unequal heating which are peculiar to kilns of older construction will not appear here in greater degree.

Yet aside from these doubts, which can be dispelled or confirmed only by actual practice, it is not difficult to show that all the phenomena of discolorations must necessarily appear with gas firing which have been condemned in the Hoffmann annular kiln, in so far as the principle of the utmost utilization of heat is retained, and those precautions are disregarded which are necessary in operating the annular kiln as well.

In any case it must be admitted that the much more complicated gas kiln is more difficult to manage, so far as the maintenance and regulation of its functions are concerned, than the ordinary annular kiln, and yet the latter surely presents difficulties enough, and is a sufficiently severe test of the intelligence of the workmen, as compared with the kilns which do not operate continuously.

If Herr Mendheim will inquire of the manufacturers of yellow bricks, whether any kind of fuel can be used in their manufacture, he will be told that the choice of fuel has a great influence upon the coloring in a kiln of any construction whatever, and that in this case it chances that the fuel producing the most ashes, such as peat and brown coal, if we exclude wood as a fuel altogether, is best adapted for the purpose, while stone coal rarely produces uniformly colored bricks but causes red discolorations on the exposed surfaces, which often extend to a depth of several millimeters into the clay mass.

Even if the red color alone did not exclude *a priori* the influence of the ashes, the depth of the colored stratum would surely do so, and the only remaining explanation of the phenomenon is the chemical action of the single ingredients of the furnace gas upon the clay.

Now chemistry teaches us that all strongly ferruginous clays, which at a certain stage of slagging assume a yellow or white color from the firing, must always contain an amount of calcium carbonate bearing a certain proportion to the iron, and that the red coloring of the brick which would otherwise be produced by the iron oxide is neutralized by the formation of a light colored iron-lime silicate.

If therefore the lime on the surface of the brick is used in any other way, so that it cannot enter into the above-mentioned light colored compound, the coloring power of the iron will appear in its full force. This case occurs frequently in practice and is always recognized by a red coloration when a stronger acid than the silicic acid is added to the lime during the firing, which may be done most easily at the beginning of the heating when water vapors can at the same time be condensed upon the surfaces of the bricks. Now sulphurous acid is always present in the furnace gases formed, when stone coal is used, and under the influence of the hydrogen and oxygen which are likewise always present in the objects to be burned, this acid converts the calcium carbonate on the surface into calcium sulphate (gypsum), and thereby renders the lime incapable of entering into a light-colored iron-lime silicate, or at least transfers this capacity to a higher temperature than is for other reasons practicable in the manufacture.

It must be remembered that gas is not a distinct kind of fuel with definite chemical properties. Its composition is dependent primarily upon the nature of the fuel from which it is formed, and the difference in the chemical composition of the gas from stone-coal, brown coal and peat can always be detected, since all the volatile elements of the solid fuel are contained in the gas, after the removal of all solid substances. Sulphur is one of these volatile substances besides carbon, hydrogen, oxygen and nitrogen, and consequently in all processes where sulphur can

exert a harmful influence it will do so just as much when gas is used as when the corresponding fuel is used without being converted into gas.

There is one very essential difference between the kilns with continuous operation, including the annular gas kiln, and the kilns of older construction, inasmuch as in the former the heat once formed is utilized to the utmost and in its last stage is used for drying the wares just set into the kiln, while in the latter the furnace gases after a short circuit pass into the open air at a very high temperature, so that the drying or water smoking may be regarded as an independent process at the beginning of the firing.

This economical use of the waste heat however causes difficulties in the water smoking process, and this is something which cannot be avoided by changing the shape of the kiln, or by using any other fuel, even gas. Uuless special precautionary measures are taken, there will be the same consequences in the gas kiln as those which appear in the Hoffmann annular kiln and in all those modeled after it, which, however, can in the latter case be remedied.

In the kilns of older construction the objects to be burned come into contact with a great volume of moderately heated dry air in the first stage of the firing—that is, in the water smoking, and in this air they easily lose their hygroscopic moisture; on the other hand in the kilns with continuous operation, the quantity of air is limited to the exact amount necessary to support the roasting fire, and moreover the air is not dry, but contains in the form of vapor a very considerable amount of water in chemical combination with the clay.

Now the cooling of the moist furnace gas can advance only to a certain limit without injuring the contents of the kiln. As the air is cooled more and more by contact with the bricks just put in and by the loss of the heat which is given up to form the compounds required by the ever-progressing vaporization, its point of saturation with vapors is soon reached or passed, so that eventually an occasional condensation of water must take place and this does take place under circumstances favorable for it and results even in a partial softening of the bricks in the kiln.

If the greatest possible economy of fuel is the only thing to be regarded in the operation of the kiln, such an occasional condensation will be the rule in gas kilns as well as in all other annular kilns—that is, the cold bricks freshly set will perspire in the moist vapor-laden air of the water-smoking chamber and the consequences of this are familiar to every brickmaker; a firmly adhering whitish efflorescence appears upon the surface, and it is sufficiently clear from what has been said above, why this coating appears more rarely in the older kilns than in the annular kilns.

If we examine the nature of these efflorescences we shall not only discover the reasons why they are more apt to appear, as I said before, on the dense surfaces of facing bricks than on the rough surfaces of the commonest bricks moulded in sand, but we shall also find the means to avoid them, unless, as frequently happens, they have been formed on the surfaces during the drying process, in which case they cannot of course be removed by the firing alone.

If the efflorescences just mentioned are examined with magnifying glasses they will appear as papillary, scaly, or vesicular masses, quite similar in appearance to those which are found upon air-dried and slightly burned bricks as well as upon very hard ones, and whose distinctive character disappears more and more when the base has passed into a clinker-like or partially fused state.

The chemical composition of these efflorescences has not often been determined up to this time, as it is difficult to obtain pure material in sufficient quantity. But the examination under the microscope shows that it is not an incrustation of ashes, since the latter can be definitely recognized, even if they are present in addition, but that it is a residue, crystalline in part, which was previously held in solution in the water, and when the water was vaporized was precipitated in solid form on the surfaces of the bricks, or else was extracted from the clay during the water-smoking process, when water was condensed upon the surface, and has been precipitated again upon the outside of the brick.

We shall not have to search long to find salts which can exert such an action and which are decomposed during the firing in such a way that the residue cannot be dissolved again in water. Carbonate of lime and gypsum are present in most clays in such quantities that the water which is contained in molded bricks may be regarded as a saturated solution of these salts. Compounds of chlorine, especially common salt, are rarely absent. Pyrites is frequently an ingredient of the clay. It is weathered during the drying and together with the other insoluble ingredients causes the formation of ferrous sulphate, aluminum sulphate, and magnesium sulphate. Besides this, when water is absorbed from the furnace gas in the first stage of water smoking, ammonia salts, alkali salts, sulphurous acid, and sulphuric acid are condensed likewise, and unless such condensation is guarded against by precautionary measures, a considerable amount of soluble matter will be precipitated upon the surface of the bricks in the kiln.

When the water is vaporized, of course all the substances held in solution in it must be precipitated in solid form and the place where this occurs will depend entirely upon the character of the evaporating surface and upon the manner in which the water is removed. If the clay mass is dense and the drying is accomplished slowly, the vaporization of the water can at first take place only at the surface, but the liquid contained in the pores can be diffused toward the interior, and will exchange its greater proportion of salt from without for the lesser amount of salt of the inner liquid, until after further drying, the pores are opened and vaporization and final precipitation of the salts can take place within the clay mass also.

The leaner the clay, or the more porous the surface, the more readily this vaporization will take place in the clay, and therefore bricks with a rough surface exhibit these efflorescences less readily.

If, on the other hand, the vaporization is accomplished quickly, or if the pores are again filled with liquid, in this case by reason of condensation upon the surface, then the diffusion cannot take place in that short time, while the liquid and vapors are penetrating out from the interior, and all the substances held in solution in the water must be precipitated upon the surface and this will occur more easily, as the density of the surface is increased.

It will be seen, therefore, that the discolorations produced in this way, which make up the larger part of such phenomena, appear during the drying and watersmoking processes and have no connection at all with the real firing process. And unless the same more favorable conditions can be secured here as in the older kilns, the use of gas, even though it be purified, offers no protection.

In the annular kiln such measures have been partially adopted, and have been attended by excellent results, and the difficulties complained of at the outset have been overcome.

If Herr Mendheim had had time to study the English brick works, and if he had made himself familiar with the manufacture of facing bricks in Middle England, in Yorkshire, Chestershire and Leicestershire, where annular kilns are in use, without any drying apparatus, where the bricks are moulded from half-moist

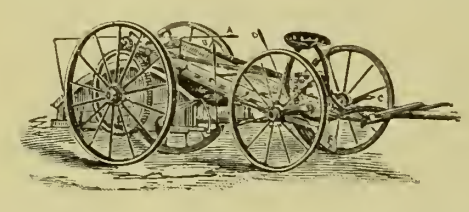
pulverized clay and are carted directly from the machine to the annular kiln, I scarcely think he would have been led to make the assertions which he does make in his article.

It is not my purpose to enter at this time into a detailed comparison of the Hoffmann annular kiln, and the annular gas kiln. The experience which has been gained with gas firing is still too little understood to justify one in pronouncing a verdict upon it. But this much I must say, that the use of gas for comparatively low degrees of heat calls forth very serious theoretical misgivings and actual practice alone will have to demonstrate how far these may be overcome.

Honor to whom honor is due. The annular kiln has certainly a great future before it in the manufacture of porcelain and the related branches of the ceramic art, and we have reason to be grateful to the Royal Porcelain Manufactory and to Herr Mendheim, who speaks in its behalf, for having opened the way for private industry. But the difference between the firing of porcelain, where everything is fused alike, and the manufacture of products with a porous structure, is very great, so that the experience gained here must be applied with the greatest caution to other branches of the clay industry. However until further results are secured, the Hoffmann annular kiln will hold the place it has won, especially in the manufacture of bricks.

Money-Saving Machine for Brick and Tile Makers.

Much time and thought has been expended of late years on the perfecting of kilns, driers and machinery and a change in the direction of the efforts for improvement will be welcomed by our readers. Philip Smith, founder and machinist, Sidney, O., is the manufacturer of the Slusser self-loading and self-dumping automatic excavator, a machine devised for the expressive purpose of facilitating the mining of the raw material. The action of



the excavator is entirely automatic and the driver and two horses can handle it without any other assistance, the loading and the unloading being accomplished without a stop. It is claimed that as much work can be done in ten hours with the Slusser excavator as can be done by any other three machines of a similar character on the market at the present time.

A great advantage is that no plowing is needed and the earth is left continually in good shape. The machine is substantially built, has few parts to repair and its manipulation can be learned easily. We imagine that this will be of great service to many brick men while its operations are not confined to the clay bank alone.

The Slusser automatic excavator will find immediate use for the accomplishment of all kinds of ditching, building railroads and street railroads, cutting down embankments and levelling up the ground, and it can be used with success anywhere where a two-horse wagon can be handled. Work can be started at once on any kind of solid soil and wherever these excavators have been in operation they have yielded entire satisfaction.

The company supplies also a fine line of wheeled scrapers and drag scrapers and applicants for catalogs and price lists will receive prompt attention. When you write mention "Brick."

Artificial Marble in Denmark.

In a recent report issued by J. C. Freeman, United States Consul at Copenhagen, Denmark, an interesting account is given of a successful attempt by a Danish master builder to produce a stone equal to marble. Denmark is without marble, but this latest triumph of human ingenuity is a stone of such delicate transitions of tint and play of color that it is impossible to distinguish it from the natural product. In cost of manufacture it can successfully compete with all other artificial marbles, while the imitation of the more expensive species does not exceed in cost that of the cheaper ones. The process of manufacture is simple and easily learned, and the cost of the outfit does not exceed $175. The article can be produced in any form desired—columns, plain or fluted, and capitals—as readily as flag slabs. The inventor claims for his product the durability of genuine marble, while the cost is only a tenth as much. At the present stage of the development of the industry the maker is able to produce a slab about half an inch thick at a cost of 14 cents per square foot. The inventor's name is Soren Schongaard, Copenhagen.

List of Clayworkers' Associations and Their Officers.

ILLINOIS CLAYWORKERS' ASSOCIATION.

W. S. Purington, Chicago, president; J. C. Mamer, Campus, vice-president; G. C. Stoll, Wheaton, secretary; William Hammersehmidt, Lombard, treasurer.

IOWA CLAYWORKERS' ASSOCIATION.

W. W. Lewis, Williamsburg, president; S. C. Beasley, Council Bluffs, vice-president; R. Goodwin, secretary and treasurer. Next meeting place, Ames, Ia.

WISCONSIN CLAYWORKERS' ASSOCIATION.

Maj. J. W. Hinkley, Green Bay, president; W. M. Meadows, Burlington, vice-president; George J. Sehwarz, Milwaukee, secretary; J. G. Hamilton, Grand Rapids, treasurer. Next meeting place Green Bay, Wis.

NORTHWESTERN BRICK MANUFACTURERS' ASSOCIATION.

E. M. Farnham, president; C. A. Sprandel, vice-president; Louis Moline, secretary and treasurer. Next meeting place Minneapolis, Minn.

NATIONAL BRICK MANUFACTURERS' ASSOCIATION.

George M. Fiske, Boston, president; Clifford Chase, Milwaukee, first vice-president; H. C. Bradley, Cleveland, O., second vice-president; John C. Miller, Washington, D. C., third vice-president; T. A. Randall, Indianapolis, Ind., secretary; John W. Sibley, Birmingham, Ala., treasurer.

OHIO TILE, BRICK AND DRAINAGE ASSOCIATION.

W. C. Wilson, Brice, O., president; W. W. Chadwick, Condit, vice-president; E. O. Bigelow, New London, treasurer; Edward F. Darnell, Grove City, secretary.

AMERICAN CERAMIC SOCIETY.

Ernest Mayer, Beaver Falls, Pa., president; Francis W. Walker, Beaver Falls, Pa., vice-president; Edward Orton, jr., Columbus, O., secretary; Stanley G. Burt, Cincinnati, O., treasurer.

The McHenry Brick & Tile Co., of Jackson, Miss., has been incorporated with a capital stock of $10,000 by J. Leggett, W. E. Merrill and A. F. Graham.

CORRESPONDENCE.

By reason of its large circulation "Brick" offers exceptional advantages for the exchange of information on practical subjects in which the clayworker is interested, and we urge our readers to avail themselves of the "Brick" correspondence columns, and lay their questions and troubles before their fellow-workers, some of whom are almost sure to know the best solutions for the problems. All answers which we can print will be paid for at our regular rates. Where the subject permits of it a sketch or drawing will often add greatly to the clearness of the answer.

Please find enclosed $1.00 for "Brick". It's worth twice the price. I shall always take "Brick"; it is more than interesting.

Samuel Nyatt.

Enclosed find $1.00 for subscription to "Brick". I have read several articles in sample copies sent me which have been of great value to us. I think "Brick" is a magazine which should be in the hands of every clayworker.

McCormick Tile & Brick Works,
By C. J. McCormick.

WHAT DO OUR READERS THINK?

Editor "Brick": A question we have not seen discussed in "Brick" is: Which is the better form for the crown over a square down-draft kiln? We have heard two opinions, one favoring a half-circle and the other a quarter-circle. Also, Is it better to build the walls of a kiln with solid grouted masonry or to build two thin walls and fill in with dry dirt? Clark Manufacturing Co.

"BRICK" MEETS EVERY WANT.

Editor "Brick": We are in receipt of your letter of April 16, and in reply would say that the results of our advertisement in your paper have been so satisfactory that we have secured the press wanted. So for the present we will not need to continue our advertisement, but, when again in need of anything in your line, we will be sure to use "Brick" for the advertising medium. Enclosed find our check for $5.00, the amount due you. Yours truly,

St. Louis, Mo. Federal Roofing Tile Co.

BRICK CRACKING IN HACKS.

Editor "Brick:" I noticed a question in April "Brick," p. 175, by Mr. Post of Spring Green, in reference to his having considerable trouble with brick cracking in hacks. We have had the same trouble with our red clay and the reason we found to be the clay was too strong. We mix about thirty yards of sand or light red loam to 100,000 brick, which makes the brick more porous and prevents cracking in hacks and makes a better and more solid brick when burned. It is the best remedy we have found in our case and may be of no use elsewhere, but Mr. Post is not the only one who has had trouble of that kind. As for brick sticking in molds there are several reasons to my knowledge, one reason, perhaps the molds are air tight in bottom instead of being a little slack on each side. Another reason, the sand must be fine and floury, also if the moulder does not understand the machine he may have more pressure on than required to fill good corners which will cause the brick to stick. Also, if the machine is out of gear the bricks will stick, as has happened in our case. The arm that shoved the mold out slipped one cog and the brick stuck terribly, or, if the wipers and press do not correspond, as well as the shove-out arm or gear, it will cause the same trouble, which can be easily remedied if you understand the machine. This has been my experience and I have seen it happen in other yards where they had considerable trouble until the point where the trouble came from was detected, sometimes it is a very small, simple thing. Yours truly, Robert Bell.

Paisley, Ont.

A TAIL OF GOOD WISHES.

Editor "Brick": Enclosed please find the "dust" and count us for another year. Our faith in "Brick" has never waned. We read it with interest and wish it and its proprietors that measure of success that has dollars attached to its tail. As an exponent of the clayworking industry it has competitors, but no equals, and is doing a work for the fraternity never before attained by any technical periodical. The field is an immense one and we feel as though we were only yet on the threshold of a future that will see clay products taking the lead in all great irrigation, drainage and architectural feats of engineering. The feats of ancient Babylon and Egypt will be as pigmies compared with what is sure to come in this great Mississippi Valley and clay will be the basis. The present generation needs educating along these lines and you are doing a good work in that direction. Yours truly,

Forest City, Ia. F. N. Pitkin, C. E.

"BRICK" IS THE BEST EVER.

Editor "Brick": I take pleasure in informing you that the advertisement which I placed in your paper to run for three issues beginning with the January number of this year, has yielded most satisfactory results. I have had answers to it from Idaho to Texas and Louisiana and from Utah to New York and Pennsylvania. In fact, brick men have corresponded with me in reference to the advertisement from almost every state in the Union. And more gratifying still has been the final result—I have closed a most satisfactory lease for the property. The result of my advertisement goes to prove that your publication has a large circulation among the brick manufacturers of this country, and I do not believe that I could have obtained the same results with an advertisement of this nature in any other publication and feel it is incumbent upon me to express my appreciation of your publication. I will also say that its reading columns have been of great benefit to the managers of my brick plant the past season. With best wishes for your continued success. Very truly yours, Milton Humes.

Huntsville, Ala.

COAL DUST FOR TILE.

Editor "Brick:" In "Brick" for April, page 193, I read some letters in regard to mixing coal dust with bricks. Could coal dust also be used to advantage in making and burning tile? If any of the readers of "Brick" have had experience in this line will they please report their success or failure in these columns and oblige.

A Reader.

The Cartersville Brick Co., of Cartersville, Ga., has been incorporated with the present capital of $6,000, with the privilege of increasing it to $50,000 for the purpose of manufacturing building brick. Samuel Caines is president, W. R. Satterfield vice-president and general manager, C. S. Caines secretary and treasurer. It is intended to enlarge the plant in the fall and operate it with driers and kilns.

Scenes of Ceramic Activity at Alfred, N. Y.

The year 1900 saw the successful launching of the New York State School of Clayworking and Ceramics at Alfred, and ever since it has justified its existence to possible doubters and cavillers by the abundance of the good work and the magnitude and variety of the ceramic tasks undertaken. Prof. Charles F. Binns, the director, is ably assisted by Mr. Daniel C. Babcock and under their tuition the advancement of the students is sure to be rapid and real.

CASTING.

TURNING THE FORMS.

The location at Alfred is a most happy one, as the workers there have easy access to collateral departments of science and

art. The building itself is of handsome appearance, being of red brick and terra cotta with gray trimmings and roofed with brown tile. It has a floor space of about 13,000 sq. ft., and a frontage of 75 ft.

THE POTTERS' WHEEL.

In the lower story are located the heavy machinery for the manufacture of brick, tile, hollow blocks and roofing tile, the slip-making plant, cylinders for the preparation of glazes and a fine workshop for the manufacture of pottery and porcelain with all the necessary modern appliances. There are also rooms for mold making and drying as also a damp cellar. The motive power is a 36-h. p. Otto gas engine, natural gas being available.

DRAWING A KILN.

On the principal floor are the executive offices, rooms for the director, laboratories and a class room. Here all the experimental work is done. The technical laboratory is provided with small

blungers and mills for working clay samples, small gas furnaces for fretting and fusing and all the necessary apparatus for the physical testing of clay. Ample provision has been made for the chemical testing of materials.

The art department of the school is located on the second floor. A fine studio is arranged, provided with all the necessary facilities for the practice of mechanical drawing, free hand drawing and applied design. Next to this is the modeling room, fitted with horizontal and vertical lathes so that the student may be enabled to realize the ideas laid down on the paper. A large space is set aside for a ceramic museum, in which examples of clay work of every type may be studied.

Adjacent to the main building is the kiln house within which are two kilns; one for the firing of common wares at a low temperature and the other for the firing of high-class wares at a high temperature.

Another great advantage to the students of Alfred is that at a short distance only, there are two plants in which brick are manufactured by the wet and dry processes, also several styles of roofing tile and quarries for floors and roofs. All the processes of actual clay manufacture may thus be watched from the clay bank to the office. A continuous kiln is also to be seen at the roofing tile plant.

Such institutions as this at Alfred offer additional evidence, if such were needed, of the great field occupied by clay wares and the increasing scarcity and increased cost of lumber is compelling the builder, contractor and architect to rely more and more on the clay manufacturer for the supply of their needs.

Pacific Coast Letter.

The new town of Eastyard or Richmond, Cal., on the east side of San Francisco Bay, is attracting much attention from the brick people of San Francisco and vicinity. The town is the terminus of the Santa Fe railroad and is building up rapidly. A few days ago the Southern Pacific railroad secured a right of way to the bay shore at that point. By many the place is considered as a coming city of much importance. Several brick yards are already under way. The Carey yards began operations about two weeks ago. At present this yard is being worked by hand, but will have machinery in operation within a few days. Oil will be used as fuel in this yard. The Richmond Brick Co. expects to get in operation this week with an equipment that is modern in every respect. Steam power will be used in operating the plant. The machinery will be operated by an engine of 120 horse power, and will have a capacity of 1,000,000 brick per month. A few days ago the Craycroft Brick Co. was incorporated with a capital stock of $25,000. The directors are G. A. R. Wetmore, J. R. Utter, Charles Wetmore, T. B. Craycroft and J. C. Craycroft. This company began operations some days ago but has been compelled to wait for the arrival of additional machinery. Oil will be used in operating the engines, driving the machinery and in burning the brick. The company expects to have a kiln of brick ready for burning by the middle of June.

The annual meeting of the stockholders of the San Francisco Brick Co. was held at the office of the company in the Hayward Building, San Francisco, on May 31st.

Henry T. Holmes, president and founder of the H. T. Holmes Brick & Lime Co. of San Francisco, died there April 28th after a lingering illness. Mr. Holmes has been connected with the brick and lime industry in this state for about a quarter of a century.

The Standard Pottery Co. has been incorporated with principal place of business at Los Angeles, Cal. The capital stock of the concern is $5,000. The directors are Thomas G. Barnard, Dr. F. S. Barnard, W. A. Barnard, Elvira E. Barnard and Frances E. Barnard, all residents of Los Angeles.

Forester K. Young has made an application to the city council of Los Angeles for permission to establish and maintain a brick yard in the Hancock survey for the purpose of manufacturing brick.

J. H. McKnight has sold three mining claims of non-plastic flint clay to the Pacific Clay Co. of Corona, Cal., for $15,000. The claims contain twenty acres each and are located three and a half miles southwest of Corona in the foothills of the Santa Ana Mountains. The deposits have been worked for eight years, but an immense supply still remains. Tests and actual experience have proved the clay to be of a high grade of refractory material and non-shrinkable in fire. Although useful for art, tiling, and other purposes, the new owners will use it exclusively for fire brick and locomotive tiling. The strata show signs of the nearness of bituminous coal, and the company will later develop this. The non-plastic flint clay is found in but few places in the United States, and at no other place on the Pacific Coast.

Work has been begun on the erection of the new library building at Alameda, Cal. The material used will be gray pressed brick, and will be secured in Alameda, being that manufactured by N. Clark & Son at the West End pottery. Gray was considered the most suitable for the purpose and will present almost the appearance of granite.

One of the probabilities of the not distant future is a fire brick plant at Lehi, Utah, for the manufacture of fire brick, tiling, etc. Several parties have recently visited that place for the purpose of looking over the clay beds about two miles north of the town. The Beck Brothers own some very promising deposits west of Lehi and it is their intention to put them on the market shortly. A force of men is at present developing the porcelain beds near Pelican point. About fifty cars of clay have been shipped from the beds near Pelican point, which are owned by Eli Kennedy and others. If the product proves satisfactory, it is expected that some Denver parties will come out and investigate the field with the intention of establishing a plant at Lehi.

A. J. Easum, proprietor of the brick yard at Colfax, Wash., reports a brisk demand for brick and has orders booked ahead for some time to come.

The Remillard Brick Company, which has an extensive plant in the suburbs of San Jose, Cal., began the season's work on May 5th. A trial run was made two days before to test the machinery and see that everything was in working order before beginning work in earnest. About one hundred hands will be employed steadily throughout the season until the fall rains begin. The total capacity of the Remillard yards, which are the largest in the state, is 82,000 brick per day, or a total of 10,000,000 brick for an average season's run. The company operates three yards in the state, the other two plants being at San Rafael and Pleasanton. In addition to the Remillard plant in Santa Clara county, there are eight other yards in the county, the aggregate annual product of them all being about 40,000,000 bricks.

F. C. Cooley of Denver, Colorado, is expected in Santa Cruz, Cal., shortly to look over that field in order to see what advantages it offers for the construction of a fire brick plant to cost about $100,000.

A brick yard is badly needed at Briceland, Cal. There is an abundance of good material there and a small kiln would without doubt prove a profitable venture. C. S. Thomas, Briceland, will give any information desired in this connection.

Holt & Gregg began the manufacture of brick for the season on May 1st at their yard at Anderson, Cal. They expect to manufacture about 6,000,000 brick during the coming season.

St. Louis Letter.

Business the past month has been fair, but many building projects, which were booked for this month have been temporarily postponed. The reason for this is probably owing to the fact that building materials have increased in price and also because of the scarcity of bricklayers. This not only applies to workmen on buildings, but also to work on the brick sewers. Even at good prices, it is hard to get enough men to do the work now in progress. The result is that a great many improvements that were contemplated this spring and summer have been deferred until fall. However, there is some construction work going on. These are principally structures that were commenced early, or those that necessity compels to have finished.

The advance in prices of all materials has been accompanied with an advance in wages to higher levels than ever before. This rise in wages as well as materials is due to the demand for skilled labor in all the building trades, and it has not yet reached its limits, for it is announced that in some branches of the building trades, the workmen are about to insist on still higher wages. At present this demand appears to be incidentally justified by the exceptional rise in the prices of food and all other articles of domestic use.

The effect of these excessively high prices and high wages is that a great many people who have contemplated building, and who put it off last year on account of the largely increased cost, are compelled by the still higher cost this year to abandon it entirely or to postpone it indefinitely, until prices have descended to a more reasonable basis.

Most of those who are building this year, are doing so because they cannot help it. Men will not build a store which costs so much that they can never hope to get a tenant for it at the high rents they would have to charge to get even 4 or 5 per cent on the investment. For the same reason they will not build residences at ruinous costs. This has caused a great scarcity of dwelling houses and has caused rents to go up at least 10 per cent. There are lots of people who would build if prices were lower, but will not build while prices remain at their present prohibitory level, and it is pretty safe to predict that in another year or two, prices will be lower because of the diminished demand. High prices have their advantages, but when they go too high, there always comes in the economic remedy that people will not buy what they cannot afford to pay for, however much they might desire it otherwise.

A statement issued by the building commissioner shows that during the month of April, there were issued permits for the erection of brick buildings valued at $1,084,576; frame buildings, $61,970; brick additions, $198,000; frame additions, $9,234. The increase all together over the corresponding month last year was $626,266.

Prices of brick remain the same as last quoted, namely; mercantile brick, $7.25; ordinary brick, $7.75; strictly hard brick, $8.25; red pressed brick, $17.50, and sidewalk and paving brick, $8.50.

The case of the striking brick makers in East St. Louis, who went to work pending an arbitration of prices, is still unsettled. The representatives of the brick manufacturers and brick makers, have been unable to agree on a third man, who, with them, is to compose the members of the Board of Arbitration who will settle the differences. Unless the third man is soon selected, a general strike may be called.

The brick and terra cotta people are doing a fair amount of work. They are working their full time and are getting out all the material they can.

The Discovery of a Malleable Glass.*

There is no doubt whatever that the manufacture of glass has been known from the earliest times. The Phoenicians were famed for their glass products which they cut, engraved and stained with the most beautiful colors, while the Egyptians from whom they probably had learned the art, have left glass vessels behind them which were made hundreds of years before Christ.

In the Metropolitan Museum of New York are to be seen early specimens of the Greek glass manufacturing art—ancient cups, bottles, vases and urns of many shapes and colors, found in the tomb on the island of Cyprus.

BOILING WATER IN CHIMNEY.

Herculaneum and Pompeii, revealed to the explorer of late years, held for the inspection of the children of the twentieth century many beautiful pieces of Roman glass and many of the houses of those cities had glass windows.

With the dark ages the art of fine glass making seems to have been lost for awhile, the Venetians alone carrying on the trade and they for a long time maintained the supremacy among the nations of the world. With the dawn of the eighteenth century the glass industry made rapid strides but it is in the latter half of the nineteenth and the beginning of the twentieth centuries that the glass maker has achieved his greatest triumphs.

*Data and illustrations by courtesy of Glass and Pottery World.

One of the latest of these triumphs has been won by an enterprising citizen of Matthews, Ind., Mr. Louis Kauffeld of the Kauffeld Glass Co. A brief description of the discovery of a new application of the material with which every clayworker is so familiar will be of general interest.

Common glass is only a silicate of potash or of soda, or sand mixed with potash or soda, and the addition of oxides and other ingredients enable the manufacturer to produce all the many varieties of glass ware which attract the eye and adorn the home of the American citizen.

Mr. Kauffeld has devoted years of research on the malleable glass problem and has at last attained the goal which so few inventors reach—success. The accompanying illustrations show some of the tests made by Mr. Kauffeld with a new malleable glass chimney and the tests themselves are well calculated to convince the most skeptical. First, a chimney was placed in a pail of ice water, and after having remained a sufficient length of time to be as cold as the water, was taken out and immediately placed on a lamp with a blaze turned as high as possible. The blaze on the wick was turned so as to flow directly on the chimney, and the smoke which collected on the chimney ran down with the water without injury to the chimney. Next a chimney was placed over a small gas stove containing clay bricks used for heating in such stoves. The fire was turned on full, the

THE WATER TEST.

chimney remaining on the bricks. The fire finally brought the temperature to such a stage that one side of the chimney was drawn in and dropped down, but no cracks were shown in the glass. Except for a slight roughness on the outside, the glass was as clear as when placed in the fire. Another test which was made was to place cold water in the belly of the chimney and then hold the chimney over the fire until the water actually boiled.

A large bulb was blown from the glass and filled with about a pint of water. It was then placed over the fire and allowed to remain there until it had boiled dry with no apparent effect on

HEATING TEST.

the glass. It would seem from this that it is impossible to break this glass with heat.

At the present time only lamp chimneys are being made, as it is only about six weeks since the process was perfected, and the chimneys are being marketed at about the same price as the other good chimneys.

A great deal remains to be done with this glass, and very few experiments have been made. It is Mr. Kauffeld's idea to devote all of his time during the summer shut down to experimenting. He expects to produce a large line of goods to which this glass will be particularly adapted.

In appearance the glass is much like the common product, a little clearer if anything, and is more elastic in its molten state. It is also very tough and does not seem so brittle as ordinary glass.

It has been reported that this glass could be hammered out like red-hot iron. This is a mistake, which every glass man knows, but the other tests were actually made before several newspaper men, and the glass was blown direct from the furnace in their presence.

Mr. Kauffeld states that so-called malleable glass has been produced in this country for several years. He does not claim to have the original malleable glass, but he does claim to make tests with his glass which no other glass will stand.

The inventor claims that this glass contains neither lime nor

lead. It is safe to say that the experiments which will be made during the coming summer will be watched with a great deal of interest.

Mr. Kauffeld is president of the concern which bears his name and has been its practical head since it started three years ago. He has been in the glass business for a number of years, and is able to get out into the shop and take up any part of the work at any time.

While the plant is not large, every department shows that time and thought have been used in arranging the work in such a way as to save time.

All the work is done under the direct supervision of Mr. Kauffeld himself.

The other officers of the concern are John H. Wood, treasurer, and M. C. Huston, secretary, all of Matthews, Ind.

New Publications.

NOTES ON POTTERY CLAYS.—The compilation of this work comprises a series of notes recently contributed to a high-class technical journal by the late James Fairie, F. G. S., a painstaking and practical geologist. The literature on this subject has been limited in extent and the publishers in gathering these notes together send them forth in the hope that they will be useful to the world's clayworkers at large. The book treats firstly, with the clay in definition, variety and properties. The definition given of clay is—an unctuous tenacious earth capable of being molded by hand and hardened by fire into permanent form. It belongs to the order of oxidized rocks and forms the argillaceous family of rocks, being a soft opaque amorphous earth of a dense texture, distinguished from every other earth by its great tenacity when moistened by water. A further distinguishing characteristic is that of its contraction and acquired hardness under the action of fire.

The various clays suitable for the manufacture of building brick, fire brick, pottery and porcelain are described in detail; the various percentages of analysis are given, but the clays, of course, are confined to those used in Europe, the work, therefore, possessing its chief interest to the American potter where it Ludgate Hill, London, but the book is handled in the United States by the Van Nostrand Co., New York. The price is $1.50 and the work may be secured from the New York publishers or from the "Brick" office.

TREATISE ON CERAMIC INDUSTRIES.—This is intended to be a complete manual for pottery, tile and brick manufacturers. It was compiled by Emile Bourry and has been translated from the French by Wilton P. Rix, examiner in pottery and porcelain to the city and guilds of the London Technical Institute. This work is possibly the most voluminous in the English language on these subjects, comprises some 760 pages and is copiously illustrated by 323 drawings and reproductions of the various machines, kilns and other contrivances for the manufacture of ceramic products. The work is calculated to appeal to the busy worker or manufacturer who has not sufficient time to study the exhaustive and original master productions of Seger or the less concise works of Brongniart. No attempt has been made in this work to revise the chemical nomenclature unless the interests of science demand it, the popular names of chemicals being retained throughout.

The work is divided into two parts. In the first part there is given a definition and classification of all ceramic products, followed by a historic summary of the ceramic art presented in most readable and concise form. Next comes a consideration of the raw materials of bodies, plastic bodies with their properties and composition, the various processes of formation by throwing, expression, compression, molding by hand, on the jolly and by slip casting. The latter portion of the first part deals with the drying of bodies, the application of the glazes thereto, the various methods of firing most in vogue, and also the many processes of decoration.

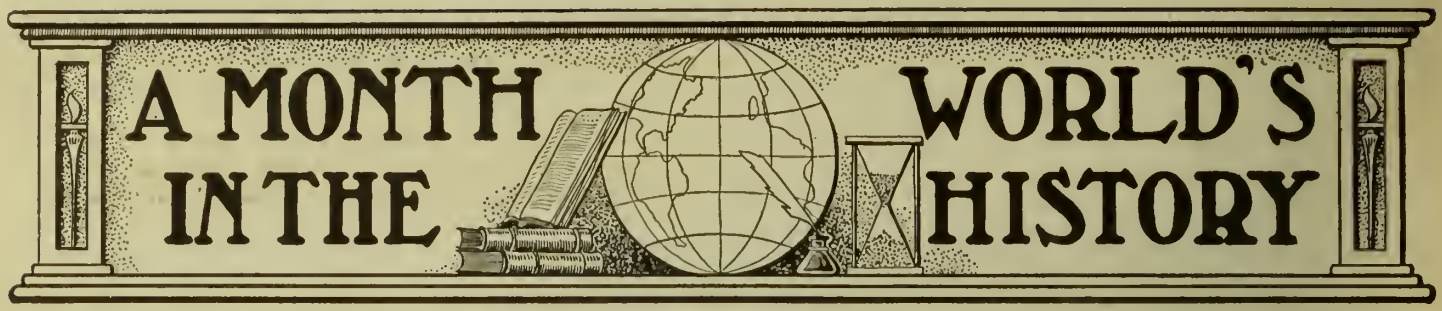
The second part treats of terra cottas, now growing so much in favor, fire clay goods, faiences, stoneware and porcelain. For convenience comparisons of the metric and British tabular systems and between the Fahrenheit and Centigrade thermometers are given. This work may be secured from the same source as the "Notes on Pottery Clays," and the price, $8.50 net, is not excessive in consideration of the enormous amount of information on practical matters which is presented in clear and concise form to the purchaser. "Treatise on Ceramic Industries" should be on the book shelf of every student of clayworking.

THE TWENTY-FIRST ANNUAL REPORT OF THE UNITED STATES GEOLOGICAL SURVEY. — No greater proof can be given of the advance of the United States to the highest planes of civilization than is afforded in the voluminous report recently issued by the Geological Survey of this great country. The present part deals with the Forest Reserves, comprising a most interesting description of the noted Forest Reserves of Washington, Montana, Minnesota and the Yellowstone territories. A specially interesting portion is that which is devoted to the examination of the Sierra Nevada, the Yosemite and Sonora quadrangles, in California.

The perusal of this work is a perpetual source of delight and admiration to the reader—delight at the wonders of nature revealed to him and admiration at the care and patience which have been exercised by the observant band of highly trained men to whom the compilation of these data is due.

The recent Martinique disaster lends additional interest to the paragraphs which we extract from this mine of useful information. "Evidences of recent volcanic activity in the Mount Rainier Reserve, Washington.—On the slopes of Mount Adams are many evidences of recent volcanic activity and important among these are cinder cones and bombs. The cinder cones are miniature volcanoes in form. One situated about three miles northeast of the summit of Mount Adams, at an elevation of 7,000 ft., is worthy of special mention. Its height is about 500 ft. and the crater at its summit has a diameter of 175 ft. and a depth of 75 ft. The cinders which form its mass and the flora growing upon it are unique and interesting. The lava, scoria and pumice are often of brilliant colors—red, yellow and orange predominting. Some of the pumice is of finer texture than that in use commercially, and the volcanic glass is found in all shades, from black to clear, transparent globules. On the northern side of Goat Peak an area of over 1,000 acres is completely covered with scoria and cinders, and this area is timberless. If a crater exists it was covered with snow at the time of examination. The bombs found on the lower slopes of Mount Adams are spherical masses of homogeneous lava and lie in piles upon the former lava flows. They are of all sizes up to 20 ft. in diameter and in every case have been fractured and their hard glassy formation exposed. Frequently the fracture planes show a rind of several inches' depth from the original spherical surface toward the center."

Through the whole volume choice bits of world history similar to the above extract are given and the hundreds of reproductions of photographs which are interspersed among the reading pages add to the charm of the articles descriptive of these vast forest reserves. Accompanying the volume in a handsome case is a series of colored maps which show clearly the geographical location of all the territories described. The present issue is stupendous in its embracement and detail, and is a most valuable contribution to our knowledge of the resources of the land of our birth or adoption.



The American forces in the Philippines won a memorable victory May 3d over the insurgents in the island of Mindanao, capturing the Moro fort at Bayan and killing 216 out of 300 defenders. The American soldiers, comprising the 25th battery and seven companies of the 27th infantry, under Colonel Baldwin, attacked the fort at daybreak, having previously spent the night in the pouring rain, without shelter or blankets. The attacking party numbered 470 men, who were drenched to the skin and nearly exhausted when the fight began. Fire was opened from four mountain guns, but after 120 rounds at a range of 1,400 yards the Moro fortifications were found to be impregnable, and the infantrymen were ordered to take the fort by storm. The fort was surrounded by four trenches which were taken successively by the Americans after hand-to-hand encounters, the Moro rebels fighting determinedly. After a desperate engagement in which the Americans lost eight, including one officer, and the Moros 216, including the sultans of Bayan and Panda Patan and Raja Muda of Bayan, their principal leaders, the Moro survivors, 84 in number, surrendered and the American victory was complete. In the cable dispatch sent by President Roosevelt May 4th congratulating General Chaffee on the achievement, the pluck of the men under Col. Baldwin's command is characterized in the highest terms.

The series of volcanic eruptions from Mount Pelee, on the island of Martinique, which began on the morning of May 8th, resulted in the total destruction of the city of St. Pierre and in loss of life which is variously estimated at from 25,000 to 40,000 persons. There have been only two similar disasters with which the fate of St. Pierre can be compared: the eruption which destroyed historic Pompeii, and that which occurred in 1883, blowing the East Indian island of Krakatoa out of the ocean and sending a sound-wave three times around the world.

Martinique is a mountainous island belonging to the chain of the lesser Antilles, and one of the principal islands in the West Indian group. Its greatest length is 43 miles, its mean width 19 miles, and its area 380 square miles. The surface is broken by a number of volcanic mountains rising to their greater height in a northerly direction till the summit is reached in Mount Pelee, in the northwest end, towering 4,430 ft. above the sea. The climate, despite the vicinity of the crater, is not one of extreme heat, the mean annual temperature being 81 deg. in the coast region. Martinique was discovered by Columbus in 1520, on one of his later voyages, and was at that time inhabited by the Carib Indians. In 1635 it was settled by the French under d'Esnambuc, and a few years later the population was augmented by the immigration of Dutch and Jews who had been expelled from Brazil and sought refuge in Martinique. Flourishing towns and cities were established, the Dutch settlers introducing the cultivation of sugar cane and the manufacture of sugar and rum, which, with the products of coffee, cotton and tobacco comprised the principal exports. With the exception of the years from 1794 to 1802, when Martinique was held by the British, the island colony has been under French rule, sending a senator and two deputies to the French Parliament, its local executives being a governor and council elected by limited suffrage. At the time of the disaster which destroyed the chief commercial city of the island last month, the total population of Martinique was reckoned at 175,000, of whom 10,000 were whites, 15,000 of Asiatic origin, and 150,000 negroes and mixed blood. Of the total area of the island nearly 90,000 acres were under cultivation, while the remainder was about equally divided by forest and savanna and by fallow. Fort de France, on the western bay, was the first city of social importance, having the largest population. St. Pierre, the commercial center, located at the base of Mount Pelee, had 25,000 inhabitants. Such had been the history and such was the condition of Martinique on May 8th last, when the volcano Pelee, which had been silent and safe for half a century, vented its fury in a terrific discharge of poisonous gas and flaming lava upon St. Pierre, literally sweeping the city out of existence before a tide of fire. Subsequent eruptions have completed the devastation of the island, laying waste broad plantations, sweeping entire forests into the ocean and raining down hot lava to maim and kill refugees in their flight. All who escaped to Fort de France were threatened with famine, the source of food supply being cut off, and greater horrors are described, resulting from the condition of the city where the innumerable dead lie unburied.

American cities were prompt and liberal in a unanimous effort to aid the survivors. Money amounting to nearly $1,000,000, clothing and provisions have been sent to Martinique, and the services of physicians, nurses and laborers rendered. The health commission of Martinique has ordered the evacuation of the northern villages which are still threatened by the volcano, in order that Fort de France, as a place of refuge, may not be still more overcrowded in the event of another eruption, and in obedience to this order 8,000 inhabitants of Lorrain, Trinite and Gros Morne have left their homes to find shelter and food where they can.

Scientists who are investigating the immediate causes of the eruption of Pelee state that there is danger of still more disastrous outbreaks from other Central American and West Indian volcanoes, and the route of the projected Nicaragua Canal is generally condemned as lying through a region where the earth's crust has been weakened by volcanic action. Some experts predict that if the canal be built it will be obliterated within a few years by the action of Mount Conseguina. An eruption of Mount Conseguina might, however, just as easily remove the barrier between the Atlantic and Pacific and thus finish the task which the French failed to do at Panama.

May 20th, precisely at noon, the flag of the United States, which has so long floated as a symbol of protection over Cuba, was formally lowered at Havana and the flag of free Cuba raised in its stead, while the guns of the fortress and from American cruisers and foreign warships volleyed a salute. The simple ceremony marked Cuba's start in life as a free and independent nation. The transfer of the government to President Palma took place at the governor general's palace in the presence of the Cuban cabinet, members of the Cuban congress, repre-

sentatives of foreign countries and invited guests. After transferring the government, on behalf of the president of the United States to President Palma, Governor General Wood embarked with the American troops and sailed for home. At four o'clock the Cuban congress assembled for the first time and the constitution was promulgated. At the same hour, religious ceremonies took place in the cathedral, and in the evening a general illumination celebrated the nation's first birthday.

The new government begins its routine under the most favorable auspices. Palma is generally lauded as a competent executive, whose rational and conservative policy should result in many improvements and the avoidance of political contention. He proposes to encourage the cotton and rubber industries and to promote new ones, and he will effect economy in management by cutting down exorbitant salaries and abolishing superfluous offices. In this connection it may be interesting to review the reforms which Uncle Sam has brought about in Cuba in the past four and a half years, in addition to the great service of freeing the islanders from the oppression of Spain. Cuba was overrun with beggars and her treasury was empty; the beggars are now provided with work and are earning a good living, and there is a reserve fund of $1,500,000 in the treasury. There were formerly no schools, and there is now an adequate number and the educational system is enlightened and thorough. Electoral law has been established. Railroads, bridges and lighthouses have been built. Municipal and rural police departments have been organized; prisons, hospitals and asylums have been founded and the sanitary systems of the island regulated. The industrial and commercial growth of Cuba has been stimulated by American enterprise and example. Best of all, the spirit of the people has been awakened to independence, and for these things the new republic is related to our own by an indissoluble bond of gratitude.

Two Thousand Dollars for a World's Fair Emblem.

The sum of $2,000 has now been definitely offered by the directorate of the World's Fair for the best emblem expressive of the importance of the Louisiana Purchase—an act which added to the United States in 1803 a territory greater in extent and natural resources than that of the original thirteen states. This emblem, design or device is to be applicable for use as the official seal of the Exposition, medal, letter head, poster or any other purpose calculated to exploit the importance of the Exposition. If colors are employed symbolically, these colors should be red, blue, yellow and white—the colors involved in the national flags of the countries in which ownership of this territory at various times has been vested. A jury of seven members, composed of two painters, two sculptors, two architects and a historian, will award the prize. Particulars of the condition of contest may be obtained from the World's Fair authorities.

Excursions to Boston via the Wabash Line.

The Wabash will sell tickets from Chicago to Boston and return, June 12, 13 and 14, at very low rates. Tickets will be good going via Niagara Falls and Hoosac Tunnel Route, via Montreal, or via New York and rail or boat lines. Final return limit July 31st. For rates, time cards and full information write F. A. Palmer, A. G. P. A., 97 Adams St., Chicago.

The American Sandstone Brick Manufacturing Co., of Saginaw, Mich., has filed articles of incorporation with a capital stock of $100,000.

Echoes from the Trade

The Henry Martin Brick Manufacturing Co., of Lancaster, Pa., has equipped the new plant of the Detroit (Mich.) Brick and Tile Co. with a complete outfit of machinery, including one of its style "A" machines.

Mr. Frank Debilius of Orangeville, Md., is reconstructing his plant and has put in a Martin latest improved dry pan; this same company has also shipped two of its 9-ft. pans to the Ferris Brick Co. of New York.

The American Blower Co. of Detroit, has recently booked orders for "Waste Heat" drier outfits for the Terre Haute (Ind.) Brick & Pipe Co.; Peebles Paving Brick Co., Portsmouth, O., and the Model Brick Co., Mineral City, O., also a large steam drier for the Denver (Col.) Sewer Pipe Clay Co.

The Westdale Brick Works of Westdale, Mass., has just installed two complete outfits of Martin machinery manufactured by the Henry Martin Brick Machine Manufacturing Co., of Lancaster, Pa. They expect a boom in the building trade this year and claim they are prepared to take care of all orders that come their way.

The May issue of "Graphite," the attractive monthly pamphlet sent forth by the Joseph Dixon Crucible Co., Jersey City, N. J., contains the usual amount of wholesome and interesting reading matter. It is ever a pleasant surprise to us to notice the careful compilation of facts creditably reflecting on this company's graphite productions. Their multifarious uses are a source of wonderment, and the Dixon people know full well how to place their merits in a tasteful yet unobtrusive way before the buying public. It may also be added that the claims of merit for the "Graphite" products are amply substantiated in service.

About three years ago the Bellevue Porcelain Works, Schenectady, N. Y., installed a drier designed by the American Blower Co. of Detroit, Mich., and in regard to the results has recently written the manufacturer as follows: "The apparatus you installed for us a few years ago we consider one of the best investments we have ever made; from the very start it has given us excellent satisfaction, and has cost us practically nothing for repairs—up to date. We have worked the apparatus very hard and must say the engine has stood the wear and tear remarkably well, and is in splendid condition to-day. We can strongly recommend the outfit to anyone desiring a blower for similar services."

F. E. Hook of Hudson, Mich., originator and manufacturer of the "Best" pneumatic coating machine and "Stay-There" fireproof paint, has brought to our notice some of the advantages to be derived from the use of his products in the painting or whitewashing the walls of brick and clayworkers' buildings, as well as for whitewashing kilns, making them not only lighter, but closing up all small crevices in one-tenth the time it takes by hand. It is claimed that with the "Best" pneumatic coating machine, either whitewash or paint can be applied more satisfactorily and durably than with brushes and at a reduction of about 80 per cent. in the cost. The work of Mr. Hook is in harmony with the apparent tendency of employers of large forces of men to better the condition

of their workmen by providing light, healthful surroundings in which to work. In addition to the more sanitary conditions resulting, a saving of about two-thirds the usual cost of lighting a building is effected where walls and ceilings are whitened, aside from affording better and longer light during the daytime.

The University of Illinois has issued its catalog descriptive of the courses in business training which will be given during the next two years. These comprise courses in banking, transportation, journalism, insurance and agriculture. Lectures by business men and other specialists in various lines will be provided. French, German and Spanish instruction is conducted so as to enable the student to acquire a practical knowledge of the language and readiness in the use of the current written and spoken idiom. Other courses take up law, mathematics, mechanical technology, philosophy, rhetoric and oratory.

The "Battle of the Driers" waged in late numbers of "Brick" has a sort of supplement in the shape of a letter from the Alonzo Curtis Brick Co., of Grant Park, Ill. This firm installed a "Standard" 4-track drier about two years ago, and was invariably successful in drying its full capacity of 40,000 brick every 24 hours. Last year it added six more tracks, and is getting equally satisfactory results from the increased capacity. The company states that it would be a pleasure to answer all inquiries regarding the operation of the "Standard" drier. The improvement in the quality of the brick of the Washington Brick, Lime & Mfg. Co. of Spokane, Wash., is also credited to its drier, which is a six-track "Standard"; the company reports rapidly increasing business, due to the present excellent condition in which their product is brought out of the drier. No brick plant, it writes, is complete without a "Standard." The Marion Brick Works, of Indianapolis, which some months since put in a new "Standard" dried at its Montezuma, Ind., plant, reports exceedingly good results from this system.

The Illinois Supply and Construction Co., St. Louis, Mo., has received the following gratifying letters from some of its customers:

"In reply to your inquiry of March 7th, concerning your patented down draft kilns in service here, it gives me pleasure to advise you that these kilns are giving us entire satisfaction. We believe that the repairs are no heavier on these kilns than on others, while the brick burned are more uniform in color and quality than in any other kiln that we have seen. We are so highly pleased with the eight kilns which have been in use here for the past three or four years that in enlarging our plant we purpose duplicating the older kilns.

"Thurber, Tex. W. K. Gordon, Gen. Mgr."

"Your favor of the 9th received. We are using three of your hand power presses and make a first class dry press brick out of shale, which requires a greater pressure than ordinary clay. We also have five four-mold dry presses of four different makes and we cannot see but what the Grath hand power press make just as nice a brick as any of the power presses. We know that the Grath hand power press will give satisfaction to all parties who may order same, and we feel that no brick yard is complete without one. Coffeyville Vit. Brick & Tile Co."

Coffeyville, Kas.

The company is also receiving many orders for its one and two-mold presses, as also for the new Grath hand power press. A complete outfit has also been shipped to J. A. White, of Vernon, Tex., for a 10,000 a day plant, including boiler, engine, pulverizer, elevator, screen, clay mixer and a 2-mold Grath press. Some of the Grath up-draft kilns will also be erected by Mr. White, with oil as fuel.

Amandus Kahl, of Hamburg, Germany, is another contestant on the field of conflict in the new industry to which we have called the attention of our readers during the past few months. He is issuing a fine catalog of lime-sand machinery and is prepared to undertake the installation of complete plants. The illustrations show similar methods of operation to those already recorded by us in the Huennekes system, although we suppose there is some difference in the machinery or the chemicals employed in the charging of steam. There seems to be no doubt that the lime and sand brick is fighting for a standing in the front ranks of the brick industry. Numerous inquiries have already been received from firms on this side of the water. Mr. Kahl already holds a prominent position in Germany among machine manufacturers.

The Fernholtz Brick Machinery Co., St. Louis, Mo., manufacturers of the Fernholtz improved brick press, the Fernholtz patent clay pulverizer and the Fernholtz iron frame clay mixer, is installed in a handsome and commodious new building where friends and patrons will be cordially received. A humorous notification of the fact is sent out by the company with a monkey embossed on the outside cover whose caudal appendage, constantly vibrating, bears out the title, " A Moving Tale."

C. Kottenhagen, formerly of Wuerz & Kottenhagen, of St. Louis, Mo., has dissolved partnership with Mr. Wuerz and is now located in Chicago. Letters to him may be addressed to Charles Kottenhagen, Chicago. Many inquiries have been received by him concerning his continuous kilns as a result of advertising in "Brick."

The Jeffrey Manufacturing Co., Columbus, O., has just issued two handsome catalogs, Nos. 67 and 69, describing the "Century" rubber belt conveyor made exclusively by the Jeffrey company, and elevating and conveying machinery, of which screening, coal handling, ash handling, coal washing, and coal mining apparatus are well-known specialties. Catalog No. 69 is devoted especially to Jeffrey screening machinery and is illustrated with diagrams and tinted half-tones. It contains as well the results of thorough tests of the machines, testimonial letters from patrons and price lists. The data afforded is carefully selected with a view to meeting the requirements of all inquirers, and should be secured by all who are interested in innovations and improvements in this line of manufacture. The Jeffrey catalogs are handsomely bound and printed, and the illustrations, of which there are many, are exceptionally good.

William Wirt Clarke & Son, Baltimore, Md., publish a breezy periodical entitled "Headquarters," which is about equally divided between humorous matter and the practical details of trade. "Headquarters" for May contains Baltimore market prices of vitrified sewer pipe and similar manufactures, a few hints to the prospective purchaser of builders' supplies, and a quantity of 18-karat jokes.

The American Blower Co., Detroit, Mich., has issued two new sectional catalogs, Nos. 139 and 140, devoted to dry kilns and ventilating fans, respectively. A preface on the theory of lumber drying gives the former a particular technical interest, and this catalog is in every respect one of the most complete and satisfactory publications of the American Blower Co. Dry kilns, hot blast